FOURTEEN NEW SPECIES OF FREELIVING MARINE NEMATODES FROM THE EXE ESTUARY

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FOURTEEN NEW SPECIES OF FREELIVING MARINE NEMATODES FROM THE EXE ESTUARY

By R. M. WARWICK

SYNOPSIS

Fourteen new species of freeliving interstitial marine nematodes are described from sandy habitats in the Exe estuary area, South Devon. They are all referable to existing genera. *Enoplolaimus denticulatus* sp. nov. is similar to *E. connexus* Wieser, 1953, but differs from it principally in the shorter cervical setae of the female, and in the form of the spicules in the male; *Mesacanthion africanthiforme* sp. nov. is characterized by the absence of a pre-cloacal supplement, by the presence of stout post-cloacal setae in the male, and by the unique structure of the spicules and gubernaculum; *Epacanthion gorgonocephalum* sp. nov. is related to *E. enoploidiformis* (Gerlach, 1952) comb. nov. and *E. oliffi* Inglis, 1966, differing from the former in the possession of a hirsute anterior end, and from the latter in the structure of the male copulatory apparatus and in the setal arrangement on the head; *Axonolaimus orcombensis* sp. nov. is closest to *A. steineri* Timm, 1954, but differs from it in the number of subcephalic setae and in the shape of the amphids, gubernaculum and spicules; *Leptolaimus ampullaceus* sp. nov. is characterized by the number of pre-cloacal supplements, by the structure of the spicules and gubernaculum, and by the presence of longitudinal files of papillae down the body-length; *Camacolaimus barbatus* sp. nov. is closest to *C. prytherchi* Chitwood, 1935, but has shorter cephalic setae, no alae on either side of the cloaca, a prominent post-cloacal supplement, lateral papillae in the oesophageal region, and a different setal arrangement on the tail; *Paralinhomoeus uniovarium* sp. nov. is characterised by its large amphids, long cephalic setae, and by the possession of a single anterior ovary; *Theristus* (*Theristus*) *denticulatus* sp. nov. is characterized by the typically complex structure of the gubernaculum and by the presence of stout ventral spines on the male tail; *Theristus* (*Theristus*) *interstitialis* sp. nov. is characterized by its long cephalic setae, by the position and size of the amphids, and by the structure of the male copulatory apparatus; *Theristus* (*Trichotheristus*) *psammoides* sp. nov. is closest to *T.* (*T.*) *vicinus* Riemann, 1966, but has larger amphids and differently shaped spicules and gubernaculum; *Chromaspirina inglisi* sp. nov. (= *C. pontica sensu* Gerlach, 1951, *nec.* Filipjev, 1918) is characterized by a uniform covering of fine hairs over the entire body-surface; *Microlaimus spirifer* sp. nov. is characterized by the position and form of the amphids, by the form of the copulatory apparatus in the male, and by the long tail; *Pomponema reducta* sp. nov. is characterized by the possession of only six cephalic setae, and by the arrangement of denticles in the buccal cavity; *Paracanthonchus opheliae* sp. nov. is characterized by the distinctive structure of the gubernaculum and of the spicules.

INTRODUCTION

During the course of an ecological survey of the distribution of freeliving nematodes in the Exe estuary, several species were discovered which proved to be new. This paper deals with the species which were fairly common in the estuary, and their ecological distribution, together with that of other species, will subsequently be discussed elsewhere. Suffice it to say that all the species described here are interstitial, and were found in sandy habitats at various tide levels at Shelly Bank, just inside the mouth of the estuary at Exmouth, and on Exmouth beach near Orcombe Point.

Measurements have been made from glycerine mounts under the camera lucida with an opisometer. Curved structures, e.g., spicules, are measured as the curve and not the chord, the oesophagus length is measured from the anterior end of the body, and the head diameters are measured at the level of the first circle of cephalic setae unless otherwise stated. The type-material has been deposited at the British Museum (Natural History). The classification used is that of De Coninck (1965), but following Inglis (1966) the only groups recognized are families and genera. Where a large amount of material is available only three males and three females have been measured, since relative and absolute measurements have only a limited taxonomic value. Attention has rather been given to the morphology of the male copulatory apparatus, in response to recent pleas by Wieser and Hopper (1967) and Inglis (1967). All the species are described from a syntypic series.

Family **ENOPLIDAE**

Enoplolaimus denticulatus sp. nov.

(Fig. 1)

Material studied. Three males and three females. B.M. (N.H.), Reg. No. 1968. 262.

Distribution in Exe Estuary. Shelly Bank: M.L.W.S.T. Orcombe Point: M.H.W.N.T., M.T.L., M.L.W.N.T.

	a	b	c	V%	Body length (mm.)
Males	52·93	4·05	19·95	—	3·97
	56·00	3·54	14·30	—	3·36
	59·22	4·12	23·11	—	3·79
Females	57·75	4·02	17·08	60·24	4·10
	51·63	4·00	21·14	62·16	4·44
	61·49	4·48	16·25	67·25	4·55

Measurements (in mm. in order of body lengths). Males: Body breadth: 0·075; 0·060; 0·064. Oesophagus length : 0·98 ; 0·95 ; 0·92. Distance of nerve ring from anterior : 0·225 ; 0·22 ; 0·22. Head diameter : 0·053 ; 0·045 ; 0·049. Length of labial setae : 0·016 ; 0·016 ; 0·017. Length of longer cephalic setae : 0·082 ; 0·082 ; 0·071. Length of shorter cephalic setae : 0·040 ; 0·040 ; 0·032. Length of longest cervical setae : 0·043 ; 0·043 ; 0·025. Length of mandibles : 0·032 ; 0·026 : 0·027. Length of onchia : 0·019 ; 0·016 ; 0·014. Tail length : 0·199 ; 0·235 ; 0·164. Cloacal diameter : 0·050 ; 0·044 ; 0·042. Spicule length : 0·053 ; 0·060 ; 0·055. Gubernaculum length : 0·022 ; 0·020 ; 0·023. Supplement length : 0·012 ; 0·008 ; 0·011. Distance of supplement anterior to cloaca : 0·139 ; 0·144 ; 0·132.

Females : Body breadth : 0·071 ; 0·086 ; 0·074. Oesophagus length : 1·02 ; 1·11 ; 1·015. Distance of nerve ring from anterior : 0·235 ; 0·25 ; 0·235. Head diameter : 0·055 ; 0·056 ; 0·050. Length of labial setae : 0·017 ; 0·018 ; 0·017. Length of longer cephalic setae : 0·092 ; 0·070 ; 0·099. Length of shorter cephalic

setae : 0·037 ; 0·029 ; 0·034. Length of longest cervical setae : 0·008 ; 0·010 ; 0·010. Length of mandibles : 0·029 ; 0·032 ; 0·029. Length of onchia : 0·019 ; 0·019 ; 0·020. Tail length : 0·24 ; 0·21 ; 0·28. Anal diameter : 0·049 ; 0·049 ; 0·051. Distance of vulva from anterior : 2·47 ; 2·76 ; 3·06.

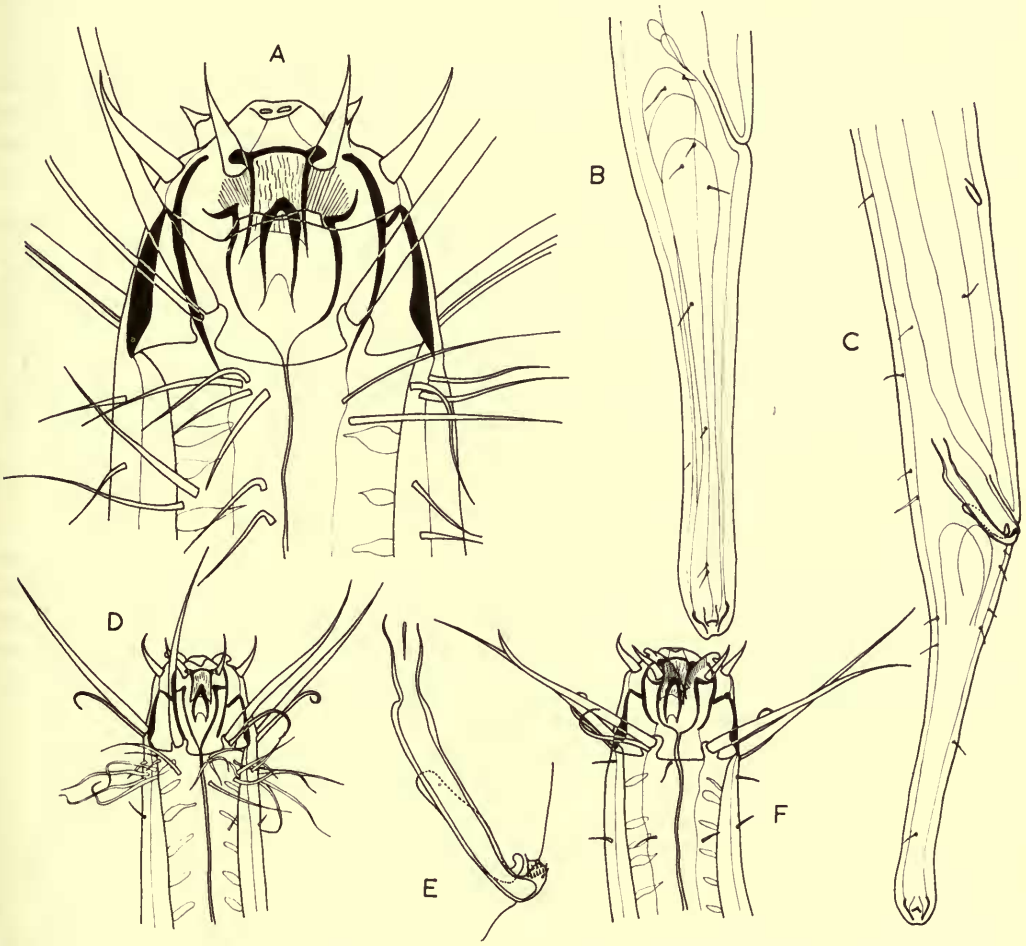


FIG. 1. *Enoplolaimus denticulatus* sp. nov. A, Details of cephalic structure of male. B, Lateral view of female tail. C, Lateral view of male tail. D, Male head. E, Lateral view of spicules and gubernaculum. F, Female head.

This is a relatively large member of the genus. The cuticle is smooth. The mouth is surrounded by three relatively high lips which have pronounced subsidiary lobes and bear semi-lunar striations on their inner surfaces (Fig. 1A). The six stout conical labial setae arise at the level of the tips of the mandibles. The six long cephalic setae are fairly stout, and the four shorter ones more slender. The posterior border of the short cephalic capsule has small incisions with fenestrae to accommodate the bases of the cephalic setae. In the male there is a series of long cervical

setae just posterior to the cephalic capsule (Fig. 1D), but the female only has a circle of six very short setae in this position (Fig. 1F). The mandibles have the usual appearance of two lateral rods united by an anterior curved bar, with the pointed tips projecting into the buccal cavity. The onchia are large, and distinct from the mandibular plate. The terminology used in describing this and subsequent members of the Enoplidae follows that of Inglis (1964).

The oesophagus is cylindrical with three files of glands down its length. Short setae are fairly numerous in the oesophageal region of both sexes, but are scarce posterior to this, becoming more numerous on the tail. The proximal third of the tail is conical and the remainder cylindrical, the tip being rounded and slightly swollen (Figs. 1B and 1C)

Male. The spicules are more or less straight when viewed laterally. The distal tips are strongly hooked and bear a series of fine denticles (Fig. 1E). The proximal ends are open and funnel shaped, and there are dorsal swellings just posterior to them. When viewed from the ventral aspect the spicules appear to be far apart proximally, bent in the middle, and closely adherent to the narrow gubernaculum in their distal half, as illustrated for *E. connexus* by Wieser (1953, p. 77, Fig. 38e). The gubernaculum is also hooked at its tip, but bears no denticles. The supplement is small, simple and tubular. The testes are paired, opposed and outstretched.

Female. The ovaries are paired, opposed and doubly reflexed. They are about equal in size.

Discussion. This species is closest to *E. connexus* Wieser, 1953, but differs from it in having much shorter cervical setae in the female, spicules of a different shape with denticulate tips, and the supplement in a more anterior position. The present species is much larger than *E. connexus*, and the cephalic setae are accommodated in fenestrae of the cephalic capsule and do not lie wholly posterior to it as in Wieser's species.

Mesacanthion africanthiforme sp. nov.

(Fig. 2)

Material studied. Three males and three females. B.M. (N.H.), Reg. No. 1968. 264.

Distribution in Exe Estuary. Shelly Bank : M.T.L., M.L.W.N.T., M.L.W.S.T. Orcombe Point : M.H.W.N.T., M.L.W.N.T.

	a	b	c	V%	Body length (mm.)
Males	81·84	5·41	19·61	—	4·49
	77·27	4·32	16·14	—	2·55
	65·83	4·09	16·01	—	2·37
Females	56·06	4·48	15·10	58·65	3·70
	57·97	4·72	21·17	61·56	3·07
	63·75	4·25	17·00	58·82	2·55

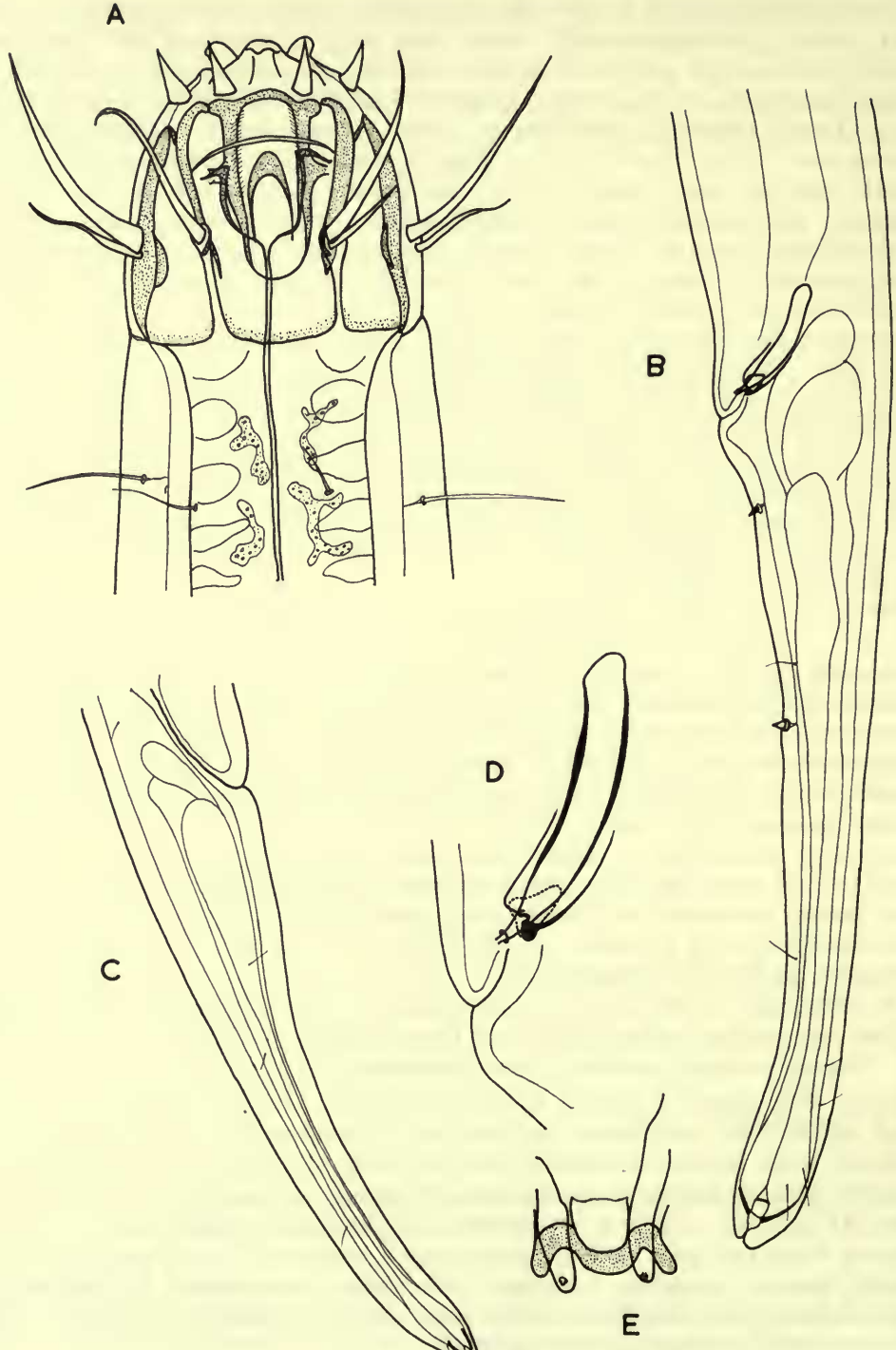
Measurements (in mm. in order of body lengths). Males : Body breadth : 0·055 ; 0·033 ; 0·036. Oesophagus length : 0·83 ; 0·59 ; 0·58. Distance of nerve ring from anterior : 0·24 ; 0·18 ; 0·18. Head diameter : 0.047 ; 0·032 ; 0·028. Length of labial setae : 0·008 ; 0·007 ; 0·006. Length of longer cephalic setae : 0·041 ; 0·026 ; 0·024. Length of shorter cephalic setae : 0·020 ; 0·013 ; 0·010. Length of longest cervical setae : 0·014 ; 0·016 ; 0·007. Length of mandibles : 0·029 ; 0·020 ; 0·019. Length of onchia : 0·017 ; 0·013 ; 0·012. Tail length : 0·229 ; 0·158 ; 0·148. Cloacal diameter : 0·047 ; 0·033 ; 0·033. Spicule length : 0·033 ; 0·025 ; 0·020. Gubernaculum length : 0·013 ; 0·011 ; 0·010. Distance of first pair of supplementary setae posterior to cloaca : 0·026 ; 0·014 ; 0·015. Distance of second pair of supplementary setae posterior to cloaca : 0·085 ; 0·050 ; 0·052.

Females : Body breadth : 0·066 ; 0·053 ; 0·040. Oesophagus length : 0·825 ; 0·65 ; 0·60. Distance of nerve ring from anterior : 0·26 ; 0·20 ; 0·19. Head diameter: 0·050 ; 0·036 ; 0·036. Length of labial setae : 0·007 ; 0·006 ; 0·006. Length of longer cephalic setae : 0·030; 0·023; 0·023. Length of shorter cephalic setae : 0·013 ; 0·010 ; 0·011. Length of longest cervical setae : 0·012 ; 0·010 ; 0·008. Length of mandibles : 0·032 ; 0·024 ; 0·023. Length of onchia : 0·020 ; 0·016 ; 0·014. Tail length : 0·245 ; 0·145 ; 0·150. Anal diameter : 0·045 ; 0·037 ; 0·033. Distance of vulva from anterior : 2·17 ; 1·89 ; 1·50. Egg length :— ; 0·215 ; —. Egg breadth : — ; 0·039 ; —.

This is a long slender species, and has a characteristically dome-shaped head (Fig. 2A). There are some irregular areas of pigmentation just posterior to the cephalic capsule. The cuticle is smooth. The three lips are relatively low, and have no internal striation. The six labial setae are stout and conical, and situated at the level of the tips of the mandibles. The cephalic setae originate from about the middle of the cephalic capsule, the posterior border of the capsule being deeply incised and the bases of the setae accommodated in fenestrae. The four shorter cephalic setae are about half the length of the six longer ones. There are six files of long setae extending one third to two thirds of the way down the oesophagus length in both sexes, but they tend to be more numerous in the male. Setae are scarce further posteriorly and become more numerous again in the tail region. The three mandibles have the usual appearance and bear prominent lateral processes. The onchia are large and equal in size.

The oesophagus is cylindrical, with the usual three files of glands down its length. The tail is conical in its distal third and the remainder is cylindrical (Figs. 2B and 2C). The tip is slightly swollen in some specimens.

Male. The spicules are small and fairly straight. They are pointed and open ended distally with a thickened cuticular ring subterminally. The gubernaculum consists of a pair of tubes surrounding the distal ends of the spicules, and these tubes are united by a median bar which has a roughly triangular appearance in lateral view (Figs. 2D and 2E). There is no cuticularized pre-cloacal supplement. The tail, however, bears two pairs of stout conical setae posterior to the cloaca, and these probably have a copulatory function. This feature is parallelled in *Africanthion nudus* Inglis, 1964, which has a similar series of setae *anterior* to the cloaca. The testes are paired, opposed and outstretched.


A
B
C
D
E

FEMALE. The ovaries are paired, symmetrical, and doubly reflexed. The eggs are large and elongate.

DISCUSSION. In this species the male is distinct from all others in the combination of the absence of a pre-cloacal supplement and the presence of stout post-cloacal setae. Also the structure of the gubernaculum and spicules is unique. It is close to the genus *Africanthion* Inglis, 1964, in that the supplement is replaced by stout setae, but cannot be referred to this genus because in *Africanthion* the onchia are unequal in size, the lips have semi-lunar striations, and the copulatory setae are pre-cloacal and not post-cloacal as in the present species. Since one other species *Mesacanthion infantile* (Ditlevsen, 1930), is also reported to have no supplement, and the head structure of the present species is typical of the genus, it will be referred to *Mesacanthion*.

Epacanthion gorgonocephalum sp. nov.

(Figs. 3 and 4)

MATERIAL STUDIED. Three males and three females. B.M. (N.H.), Reg. No. 1968. 263.

DISTRIBUTION IN EXE ESTUARY. Shelly Bank : M.L.W.N.T., M.L.W.S.T. Orcombe Point : M.H.W.S.T., M.H.W.N.T., M.T.L., M.L.W.N.T., M.L.W.S.T.

	a	b	c	V%	Body length (mm.)
Males	48·52	4·36	19·32	—	4·27
	47·44	4·38	20·53	—	4·27
	52·32	4·38	18·90	—	4·29
Females	34·86	4·58	21·38	58·84	4·81
	44·10	4·45	20·13	60·04	4·63
	37·32	4·56	20·70	60·34	4·74

MEASUREMENTS (in mm. in order of body lengths). Males : Body breadth : 0·088 ; 0·090 ; 0·082. Oesophagus length : 0·98 ; 0·975 ; 0·98. Distance of nerve ring from anterior : 0·185 ; 0·192 ; 0·190. Head diameter: 0·059 ; 0·055 ; 0·052. Length of labial setae : 0·021 ; 0·019 ; 0·022. Length of longer cephalic setae : 0·074 ; 0·063 ; 0·073. Length of shorter cephalic setae : 0·043 ; 0·042 ; 0·039. Length of longest subcephalic setae : 0·036 ; 0·037 ; 0·035. Length of shortest subcephalic setae : 0·012 ; 0·017 ; 0·011. Length of longest cervical setae : 0·048 ; 0·044 ; 0·035. Length of longest body setae : 0·029 ; 0·027 ; 0·024. Distance of dense ring of setae from anterior : 0·31 ; 0·32 ; 0·30. Mandible length : 0·020 ;

FIG. 2. *Mesacanthion africanthiforme* sp. nov. A, Male head. B, Lateral view of male tail. C, Lateral view of female tail. D, Lateral view of spicules and gubernaculum. E, Ventral view of spicules and gubernaculum.

0·019 ; 0·020. Tail length : 0·221 ; 0·208 ; 0·227. Cloacal diameter : 0·060 ; 0·057 ; 0·052. Spicule length : 0·053 ; 0·051 ; 0·050. Gubernaculum length : 0·020 ; 0·018 ; 0·018.

FIG. 3. *Epacanthion gorgonocephalum* sp. nov. A, Male head. B, Lateral view of spicules and gubernaculum. C, Ventral view of spicules and gubernaculum.

Females : Body breadth : 0·138 ; 0·105 ; 0·128. Oesophagus length : 1·05 ; 1·04 ; 1·04. Distance of nerve ring from anterior : 0·221; 0·198 ; 0·215. Head diameter : 0·059 ; 0·062 ; 0·062. Length of labial setae : 0·023 ; 0·019 ; 0·019. Length of longer cephalic setae : 0·082 ; 0·071 ; 0·073. Length of shorter cephalic setae : 0·035 ; 0·032 ; 0·034. Length of longest subcephalic setae : 0·012 ; — ; 0·011. Length of longest cervical setae : 0·028 ; 0·029 ; 0·026. Length of longest body

setae : 0·023 ; 0·024 ; 0·019. Mandible length : 0·022 ; 0·019 ; 0·019. Tail length : 0·225 ; 0·230 ; 0·229. Anal diameter : 0·072 ; 0·068 ; 0·072. Distance of vulva from anterior : 2·83 ; 2·78 ; 2·86. Egg length : 0·264 ; 0·363 ; 0·312. Egg breadth : 0·113 ; 0·092 ; 0·091.

FIG. 4. *Epacanthion gorgonocephalum* sp. nov. A, Anterior end of female. B, Lateral view of female tail. C, Lateral view of male tail. D, Anterior end of male.

The body is relatively long and slender, and the cuticle smooth. The three lips have a marked subsidiary lobe, and internally are marked by semi-lunar striations posterior to a line running backwards from the tips of the mandibles. The outer parts of the lip are marked by wider spaced striations, and the lip margin is scalloped. The subsidiary lobe has no internal striation or scalloped edge (Fig. 3A). The labial setae are stout, and originate just posterior to the tips of the mandibles. There are

six long and four shorter cephalic setae situated at the level of the bases of the onchia. In the male there are twelve groups of subcephalic setae, three per group, one being long, one of medium length and one short. In the female only six single short subcephalic setae are present, or these may be absent altogether (Fig. 4A). The bases of the larger cephalic setae are supported by small areas of thickened cuticle in the head. The mandibles are typical of the genus. They appear in optical section as two longitudinal rods joined by a thin sheet of cuticle, and are relatively long and slender. The three onchia are equal in size and are situated at the bases of the mandibles. The onchial plate is rounded posteriorly, and has well-developed radial processes. Each of the three plates curve inwards posteriorly, and their posterior edges almost meet at the base of the buccal cavity. The cephalic slits are prominent and crescentic, and are situated just anterior to the level of the tips of the onchia. There are numerous long dense cervical setae in the male, and there is a region of very dense, but rather shorter setae about one-third of the way down the oesophagus length (Fig. 4D). Posterior to this setae become scarcer, increasing in density again on the tail. In the female cervical setae are sparse (Fig. 4A), and there are very few setae on the body-surface until just before the anus.

The oesophagus is swollen anteriorly round the base of the buccal cavity, and is otherwise cylindrical with the usual three files of glands down its length. The anterior half of the tail is conical and the posterior half cylindrical (Figs. 4B and 4C).

Male. The gubernaculum consists of a short double tube surrounding the ends of the spicules, and bears two small lateral projections distally (Figs. 3B and 3C). The spicules are short and slightly curved, and each bears distally a pair of laterally curving knobs. There is no pre-cloacal supplement. The testes are not visible.

Female. The ovaries are paired, symmetrical, opposed and reflexed. There is usually only one egg per uterus, but one specimen was found with two in the anterior uterus.

Discussion. This species is similar to *Enoplolaimus enoploidiformis* Gerlach, 1952, which should be transferred to *Epacanthion*, and also to *Epacanthion oliffi* Inglis, 1966, which both have short spicules and no pre-cloacal supplement. *E. enoploidiformis* does not have a hirsute anterior end as do *E. oliffi* and *E. gorgonocephalum*, while *E. oliffi* differs from the present species in having no gubernaculum, spicules with denticulate tips and a different setal arrangement on the head.

Family **AXONOLAIMIDAE**

Axonolaimus orcombensis sp. nov.

(Fig. 5)

Material studied. Three males and three females. B.M. (N.H.), Reg. No. 1968. 265.

Distribution in Exe Estuary. Orcombe Point : M.L.W.N.T., M.L.W.S.T.

	a	b	c	V%	Body length (mm.)
Males	111·07	14·81	20·73	—	3·11
	93·13	14·90	20·55	—	2·98
	113·13	15·74	21·55	—	3·62
Females	83·32	14·18	20·53	62·50	3·12
	91·43	14·55	21·92	56·25	3·20
	92·00	15·33	21·61	59·63	3·22

Measurements (in mm. in order of body lengths). Males : Body breadth : 0·028 ; 0·032 ; 0·032. Oesophagus length : 0·21 ; 0·20 ; 0·23. Distance of nerve ring from anterior : 0·113 ; 0·120 ; 0·134. Distance of excretory pore from anterior : 0·034 ; 0·029 ; 0·036. Head diameter : 0·012 ; 0·013 ; 0·013. Length of cephalic setae : 0·023 ; 0·024 ; 0·026. Length of subcephalic setae : 0·018 ; 0·018 ; 0·017. Amphid length : 0·007 ; 0·007 ; 0·007. Amphid breadth : 0·006 ; 0·006 ; 0·006. Body diameter at level of amphids : 0·014 ; 0·015 ; 0·014. Length of buccal cavity: 0·021 ; 0·022 ; 0·024. Tail length : 0·150 ; 0·145 ; 0·168. Cloacal diameter : 0·028 ; 0·030 ; 0·031. Spicule length : 0·043 ; 0·045 ; 0·048. Gubernaculum length : 0·021 ; 0·022 ; 0·023.

Females : Body breadth : 0·037 ; 0·035 ; 0·035. Oesophagus length : 0·22 ; 0·22 ; 0·21. Distance of nerve ring from anterior : 0·132 ; 0·122 ; 0·124. Distance of excretory pore from anterior : 0·035 ; 0·032 ; 0·035. Head diameter : 0·013 ; 0·014 ; 0·014. Length of cephalic setae : 0·023 ; 0·027 ; 0·024. Length of subcephalic setae : 0·013 ; 0·018 ; 0·015. Amphid length : 0·006 ; 0·007 ; 0·006. Amphid breadth : 0·006 ; 0·006 ; 0·006. Body diameter at level of amphids : 0·016 ; 0·016 ; 0·016. Length of buccal cavity : 0·023 ; 0·023 ; 0·022. Tail length: 0·152 ; 0·146 ; 0·149. Anal diameter : 0·025 ; 0·029 ; 0·028. Distance of vulva from anterior : 1·95 ; 1·80 ; 1·92. Egg length : 0·198 ; — ; —. Egg breadth : 0·027 ; — ; —.

The body is long and slender, and the cuticle marked by fine transverse striations, which commence just behind the cephalic setae and extend almost to the tail-tip. The mouth is surrounded by six rounded lips each bearing a small conical labial papilla. There are four long cephalic setae, and in the male a circle of eight long subcephalic setae is situated just anterior to the base of the buccal cavity, while in the female the sublateral subcephalic setae are paired, giving twelve in all (Figs. 5A and 5B). The posterior portion of the buccal cavity is long and tapering, and there are no odontia in the anterior portion. The ampids are small, describing a single loop, and are almost circular in outline.

The oesophagus is cylindrical throughout its length. A few short scattered setae are present on the body-surface, particularly in the cervical region and on the tail. The tail tapers throughout its length, and in the male bears two ventrolateral files of short setae and a pair of terminal setae about 0·009 mm. long, but these are absent in the female (Figs. 5D and 5E).

Male. The gubernaculum has a strong, irregularly-shaped, dorsally-pointing

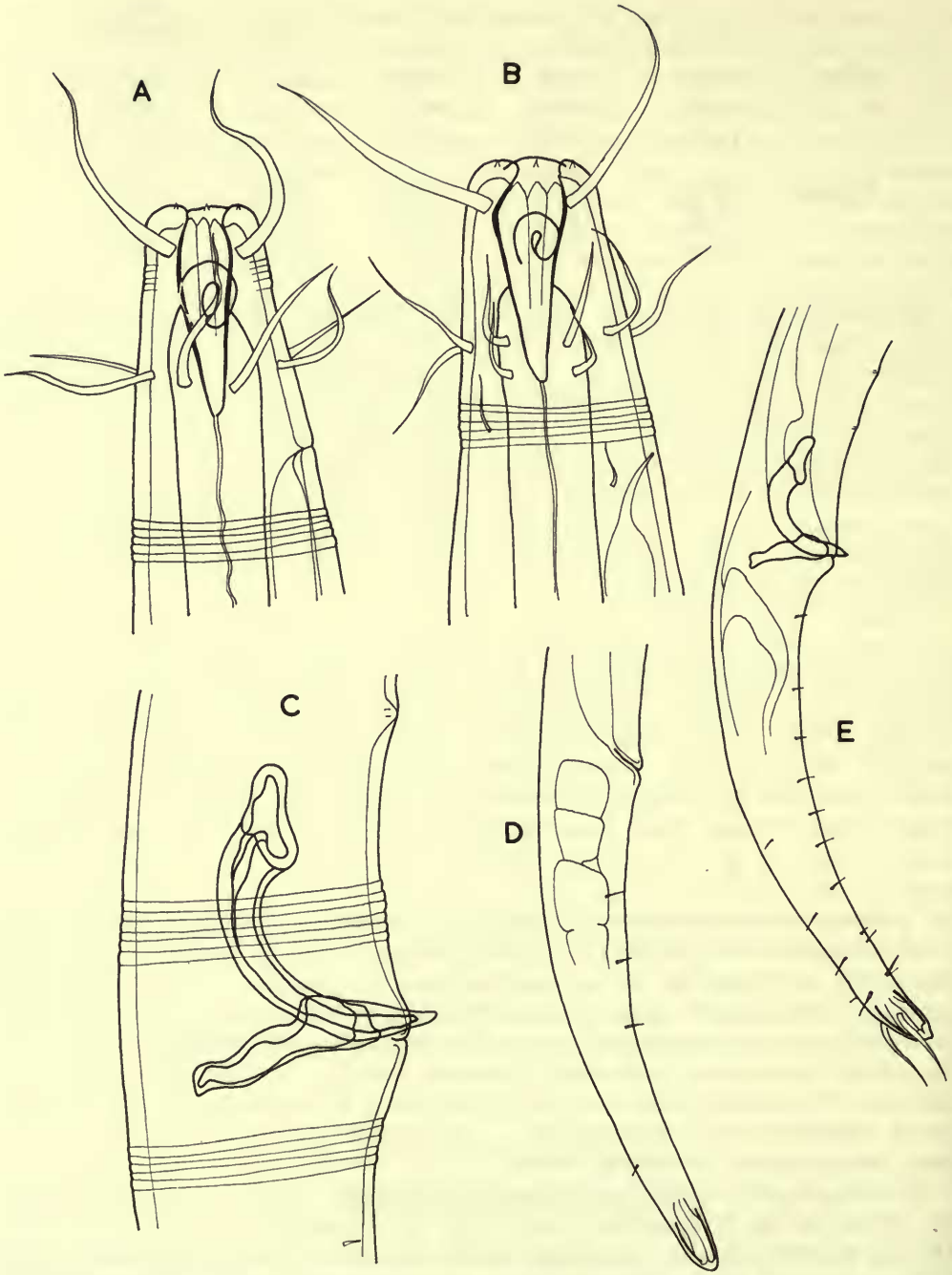


FIG. 5. *Axonolaimus orcombensis* sp. nov. A, Lateral view of male head. B, Lateral view of female head. C, Lateral view of cloacal region in male. D, Lateral view of female tail. E, Lateral view of male tail.

apophysis (Fig. 5C). The spicules are arcuate, strongly cephalate proximally and pointed distally. There are 20–30 pre-cloacal supplements, more widely spaced posteriorly than anteriorly. Each consists of a small pore, and between them the ventral body-cuticle is markedly thickened. The testes are paired, opposed and outstretched.

Female. The ovaries are paired, symmetrical, opposed and reflexed. The eggs are very large and elongate.

Discussion. The only other species with cephalic setae approaching two head diameters in length and with amphids which do not reach the level of the base of the buccal cavity is *A. steineri* Timm, 1954. *A. orcombensis* differs from this species in the number of subcephalic setae, in the shape of the amphids, in the form of the gubernaculum and spicules and in the general body proportions.

Family **LEPTOLAIMIDAE**

Leptolaimus ampullaceus sp. nov.

(Fig. 6)

Material studied. Three males and three females. B.M. (N.H.), Reg. No. 1968. 266.

Distribution in Exe Estuary. Shelly Bank : M.T.L., M.L.W.N.T., M.L.W.S.T. Orcombe Point : M.L.W.S.T.

	a	b	c	V%	Body length (mm.)
Males	61·43	7·05	7·17	—	0·86
	58·67	6·93	6·52	—	0·88
	67·87	8·48	7·04	—	0·95
Females	45·52	7·17	7·76	48·49	1·32
	61·18	7·70	6·62	46·15	1·04
	51·76	6·98	6·29	48·86	0·88

Measurements (in mm. in order of body lengths). Males : Body breadth: 0·014 ; 0·015 ; 0·014. Oesophagus length : 0·122; 0·127 ; 0·112. Distance of nerve ring from anterior : 0·075 ; 0·080 ; 0·178. Head diameter : 0·004 ; 0·005 ;0 0·05. Length of cephalic setae : 0·005 ; 0·006 ; 0·005. Amphid breadth : 0·005 ; 0·005 ; 0·005. Amphid length : 0·006 ; 0·007 ; 0·006. Body diameter at level of amphids : 0·007 ; 0·008 ; 0·008. Tail length : 0·120 ; 0·135 ; 0·135. Cloacal diameter : 0·014 ; 0·015 ; 0·014. Spicule length : 0·017 ; 0·018 ; 0·019. Gubernaculum length : 0·009 ; 0·009 ; 0·009. Supplement length : 0·010 ; 0·011 ; 0·010.

Females : Body breadth : 0·029 ; 0·017 ; 0·017. Oesophagus length : 0·184 ; 0·135 ; 0·126. Distance of nerve ring from anterior : 0·111 ; 0·094 ; 0·083. Head diameter : 0·007 ; 0·007 ; 0·005. Length of cephalic setae : 0·008 ; 0·007 ; 0·005.

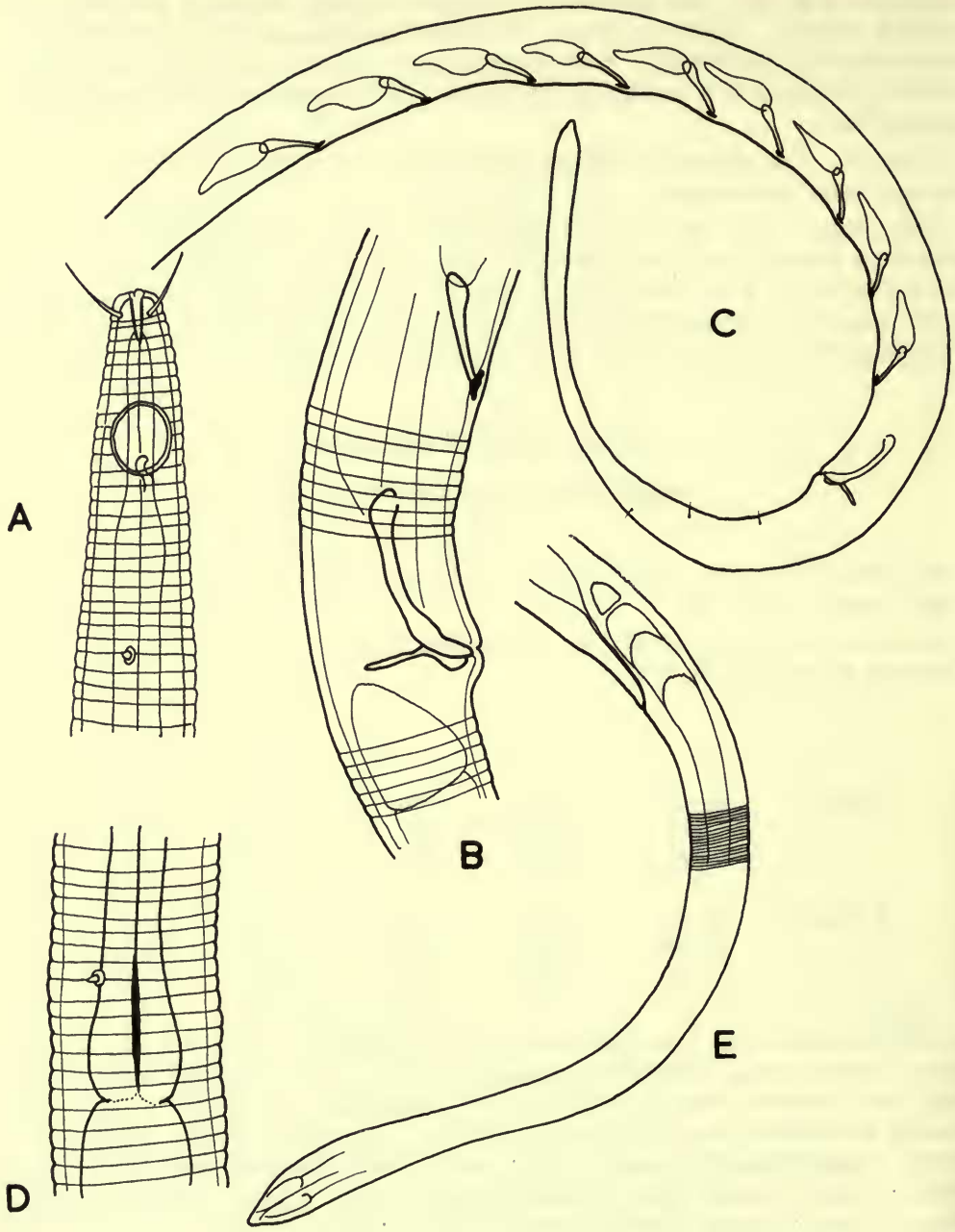


FIG. 6. *Leptolaimus ampullaceus* sp. nov. A, Lateral view of male head. B, Lateral view of cloacal region in male. C, Lateral view of posterior end of male. D, Region of oesophageal bulb. E, Lateral view of female tail.

Amphid breadth : 0·005 ; 0·004 ; 0·004. Amphid length : 0·006 ; 0·005 ; 0·004. Body diameter at level of amphids : 0·009 ; 0·008 ; 0·007. Tail length : 0·170 ; 0·157 ; 0·140. Anal diameter : 0·015 ; 0·013 ; 0·010. Distance of vulva from anterior : 0·64 ; 0·48 ; 0·43. Egg length : 0·066 ; — ; —. Egg breadth : 0·015 ; — ; —.

Transverse striation of the cuticle extends from the level of the cephalic setae to the tip of the tail. There is no lateral differentiation, but a single file of prominent conical papillae is present down each side of the body. The lips are indistinct and no labial papillae can be seen. Four long cephalic setae are present. The buccal cavity appears to be small and conical (Fig. 6A), but merges imperceptibly with the lumen of the oesophagus and may possibly be long and tubular as in other members of the genus. The amphids are large, and oval in outline. The amphidial nerve is prominent, and exits posteriorly. The amphids are slightly larger in the male than in the female. The oesophagus is narrow at its anterior end and broadens just posterior to the amphids. It has three small swellings along its length, and terminates in a small bulb (Fig. 6D). The long tail is more or less cylindrical in the female, but in the male the first third is conical and the posterior two-thirds filiform (Figs. 6C & 6E). There are a few scattered setae on the male tail.

Male. The gubernaculum is small, and bears a pair of dorsal apophyses which are relatively slender (Fig. 6B). The spicules are dilated distally, with pointed tips, and become narrow proximally with cephalate ends. There are 7–9 tubular well-cuticularized pre-cloacal supplements, each being cephalate proximally and attached to a pear-shaped ampulla. Distally they pass through a small densely-thickened area of body-cuticle. The testes are paired, opposed and outstretched.

Female. The ovaries are paired, symmetrical, opposed and outstretched. The eggs are large and elongate. In the third female measured above there is a single ventral supplement identical in structure to those found in the male. It is situated 0·170 mm. posterior to the vulva.

Discussion. This species is probably closest to *L. setiger* Schuurmans Stekhoven & De Coninck, 1933, the males of which are described by Gerlach (1952). It differs from this species in the number of pre-cloacal supplements (16 in *L. setiger*), in the structure of the gubernaculum and spicules, and in the presence of lateral files of papillae down the body-length. There may also be a difference in the structure of the buccal cavity but, as mentioned above, this feature is difficult to interpret in the present specimens.

Family **CAMACOLAIMIDAE**

Camacolaimus barbatus sp. nov.

(Fig. 7)

Material studied. Two males and one female. B.M. (N.H.), Reg. No. 1968. 267.

Distribution in Exe Estuary. Shelly Bank : M.H.W.N.T., M.T.L., M.L.W.S.T.

	a	b	c	V%	Body length (mm.)
Males	51·84	7·30	21·18	—	1·97
	50·25	7·44	21·85	—	2·01
Female	48·11	6·85	21·71	52·25	1·78

MEASUREMENTS (in mm. in order of body lengths). Males : Body breadth : 0·038 ; 0·040. Oesophagus length : 0·27 ; 0·27. Distance of nerve ring from anterior : 0·122 ; 0·148. Head diameter : 0·011 ; 0·011. Length of cephalic setae : 0·003 ; 0·003. Amphid width : 0·005 ; 0·004. Length of buccal tooth : 0·029 ; 0·029. Tail length : 0·093 ; 0·092. Cloacal diameter : 0·031 ; 0·032. Spicule length : 0·058 ; 0·053. Gubernaculum length : 0·016 ; 0·015.

Female : Body breadth : 0·037. Oesophagus length : 0·26. Distance of nerve ring from anterior : 0·153. Head diameter : 0·012. Length of cephalic setae : 0·003. Amphid width : 0·005. Length of buccal tooth : 0·032. Tail length : 0·082. Anal diameter : 0·028. Distance of vulva from anterior : 0·93.

Coarse transverse striations of the cuticle commence just posterior to the cephalic setae and extend to a level just anterior to the spinerette on the tail-tip. Two lateral longitudinal lines indicate narrow fields of unstriated cuticle, and can first be detected a short distance behind the base of the oesophagus. They fade out just posterior to the anus or cloaca. There is a lateral file of small conical papillae between the head and the base of the oesophagus, but otherwise the body is naked.

The lips are indistinct, and there are six small conical labial papillae. The four cephalic setae are very short. The dorsal buccal tooth has a prominent shoulder near its distal tip where it leaves the oesophageal musculature (Fig. 7B). The distal tip of the tooth is rounded, and proximally it extends far down into the lumen of the oesophagus. The amphids are positioned just anterior to the cephalic setae. They are more or less circular, with the amphidial nerve extremely prominent and attached to the dorsal side of the amphid. The anterior four-fifths of the oesophagus is narrow and cylindrical, with three small swellings down its length. The posterior fifth is conical, giving the oesophagus a broad base. The tail is conical, with a pointed unstriated spinerette (Figs. 7A and 7C).

MALE. The gubernaculum is small, with pointed apophyses projecting dorsally on both the dorsal and ventral sides of the spicule tips (Fig. 7C). The spicules are bent in the middle, with the proximal half swollen and the distal half narrow. Proximally they terminate in sharp right-angle bends so that the tips point ventrally. There is a pair of stout conical setae just posterior to the cloaca. A large ventral post-cloacal supplement is present one quarter of the tail-length from the tail tip. It consists of a circular area of thin cuticle by which the epidermis communicates by a protoplasmic thread with the exterior. On either side of the supplement is a stout conical seta, and there is another pair of setae positioned more laterally between the supplement and tail-tip. The testes are paired, opposed and outstretched.

FEMALE. The ovaries are paired, symmetrical, opposed and reflexed.

Discussion. This species is closest to *C. prytherchi* Chitwood, 1935, but differs from it in having much shorter cephalic setae (3μ as compared with 8–10μ), no alae on either side of the cloaca, and in having a prominent post-cloacal supplement. *C. prytherchi* has only one pair of setae on the male tail (the pair immediately posterior to the cloaca), and has no lateral papillae in the oesophageal region. *C. prytherchi* has been redescribed by Wieser and Hopper (1967), and it is with this description that

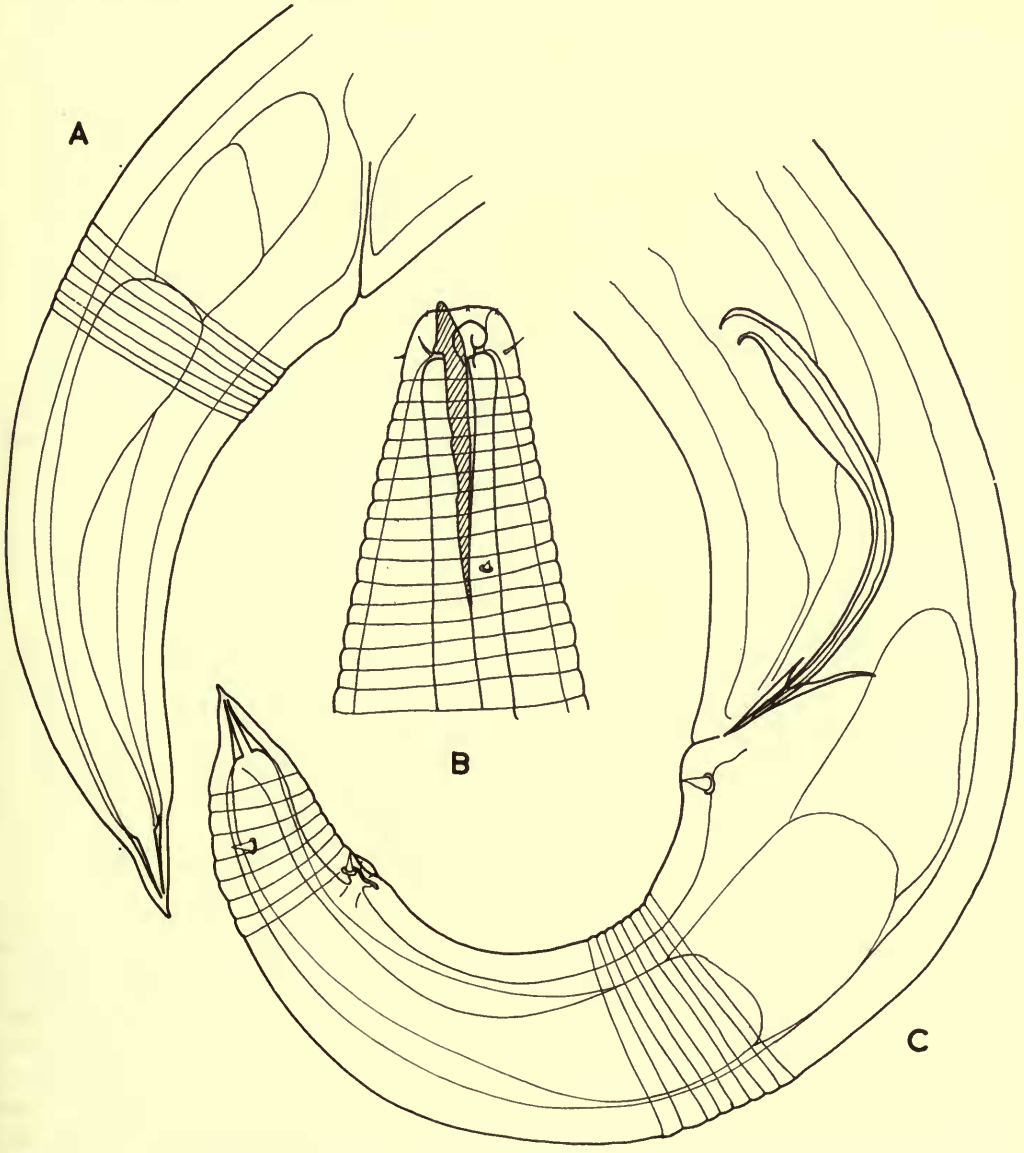


Fig. 7. *Camacolaimus barbatus* sp. nov. A, Lateral view of female tail. B, Lateral view of male head. C, Lateral view of male tail.

the present species is compared since these authors, in re-examining the type-specimen, have found structures not originally described by Chitwood.

Family **LINHOMOEIDAE**

Paralinhomoeus uniovarium sp. nov.

(Fig. 8)

Material studied. One male and two females. B.M. (N.H.), Reg. No. 1968. 268.

Distribution in Exe Estuary. Shelly Bank: M.L.W.S.T.

	a	b	c	V%	Body length (mm.)
Male	64·38	16·75	14·11	—	2·06
Females	61·30	16·79	15·84	59·22	2·82
	53·58	17·75	13·33	59·51	2·84

Measurements (in mm. in order of body lengths). Male : Body breadth : 0·032. Oesophagus length : 0·123. Distance of nerve ring from anterior : 0·084. Distance of excretory pore from anterior : 0·072. Head diameter : 0·018. Length of longer cephalic setae : 0·018. Length of shorter cephalic setae : 0·013. Length of cervical setae : 0·007. Amphid length : 0·016. Amphid breadth : 0·013. Body diameter at level of amphids : 0·018. Distance of amphids from anterior : 0·011. Tail length : 0·146. Cloacal diameter : 0·021. Spicule length : 0·023. Gubernaculum length : 0·012.

Females : Body breadth : 0·046 ; 0·053. Oesophagus length : 0·168 ; 0·160. Distance of nerve ring from anterior : 0·097 ; 0·098. Distance of excretory pore from anterior : 0·088 ; 0·084. Head diameter : 0·027 ; 0·020. Length of longer cephalic setae : 0·019 ; 0·018. Length of shorter cephalic setae : 0·012 ; 0·012. Length of cervical setae : 0·005 ; 0·007. Amphid length : 0·017 ; 0·017. Amphid breadth : 0·013 ; 0·014. Body diameter at level of amphids : 0·025 ; 0·024. Distance of amphids from anterior : 0·013 ; 0·013. Tail length : 0·178 ; 0·213. Anal diameter : 0·023 ; 0·023. Distance of vulva from anterior : 1·67 ; 1·69. Egg length : — ; 0·142. Egg breadth : — ; 0·041.

The body is long and slender. The cuticle is marked by fine transverse striations commencing at the level of the amphids and extending almost to the tail-tip. The mouth is surrounded by six low lips each bearing a small conical labial papilla. There are four long cephalic setae and six shorter ones. In the male the cervical setae commence well anterior on the body, and what appears to be a pair of lateral cephalic setae in Fig. 8A is in fact one cephalic and one cervical seta. The buccal cavity is cyathiform and rather weakly cuticularized (Figs. 8A and 8B). The amphids are slightly subcircular, elongate longitudinally, and are broken at the base for the exit of the amphidial nerve. They are concave, but have a circular raised region in the centre.

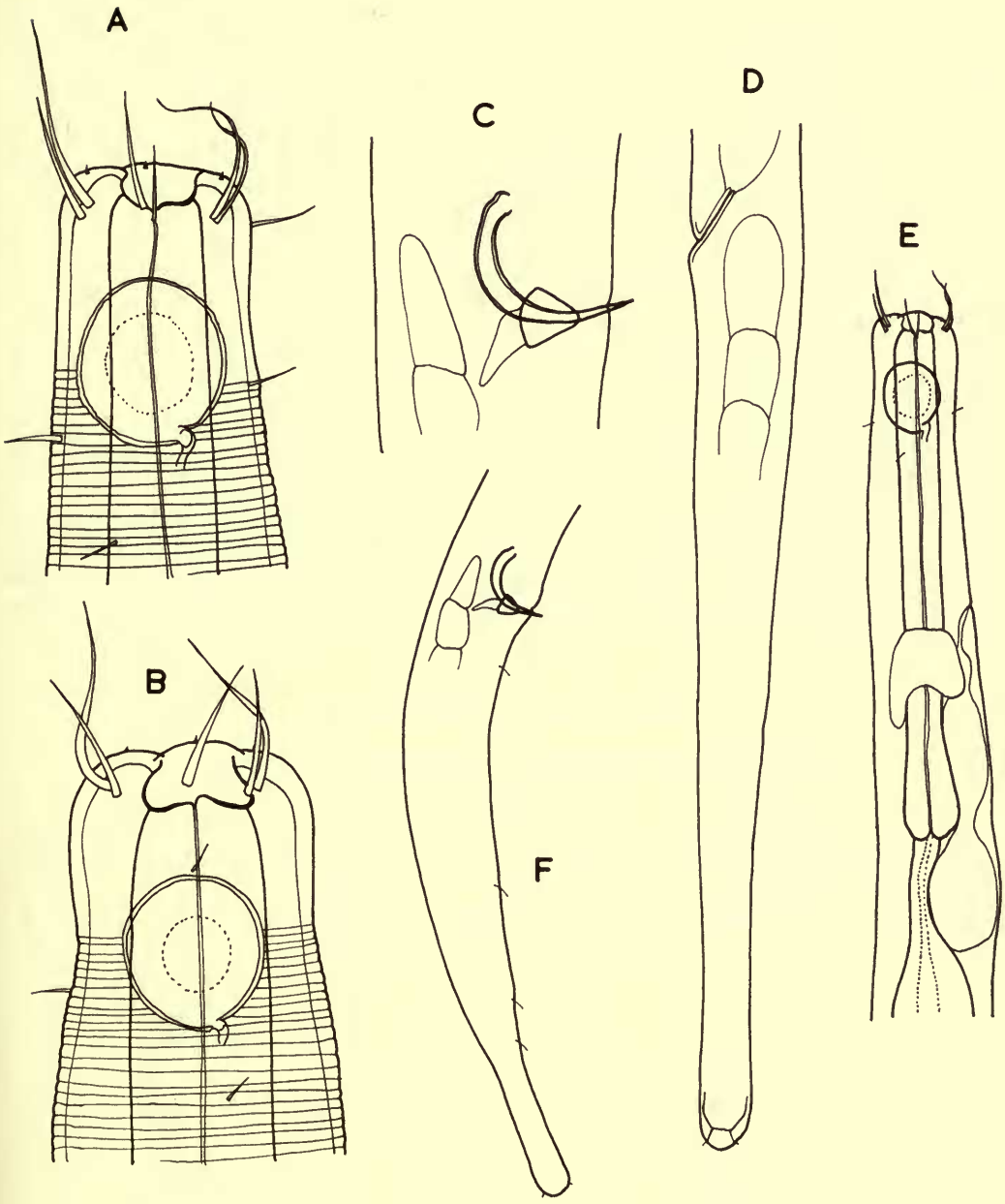


FIG. 8. *Paralinhomoeus uniovarium* sp. nov. A, Lateral view of male head. B, Lateral view of female head. C, Lateral view of spicules and gubernaculum. D, Lateral view of female tail. E, Anterior end of male. F, Lateral view of male tail.

The oesophagus is slightly swollen at its base (Fig. 8E), and the ventral gland extends just beyond this swelling. There are a few scattered setae in the cervical region, and on the male tail, but otherwise the body is naked. The tail is long, and in the male the proximal three-quarters is tapering and the distal quarter cylindrical (Fig. 8F). The female tail is more evenly tapered down its entire length (Fig. 8D).

Male. The gubernaculum is roughly triangular in lateral view, with a pair of weakly-cuticularized postero-dorsal apophyses (Fig. 8C). The spicules are short and strongly arcuate, very slightly cephalate proximally and pointed distally. The testes are not visible.

Female. There is a single long anterior outstretched ovary, and the posterior one is reduced to a small post-vulvular sac.

Discussion. Species are known from this genus both with paired and single ovaries. However, a division of the genus on this basis cannot be made at the present time since the form of the female reproductive system has not been noted in all species descriptions, and cannot always be inferred from the position of the vulva alone. Further, some species are described from males only. The present species is in many respects intermediate between *Paralinhomoeus* de Man, 1907, and *Halinema* Cobb, 1920. It has large amphids with a central raised portion, as in *Halinema*, but the cephalic setae are shorter and there are neither subventral rows of conoid appendages nor long terminal setae on the male tail. *Paralinhomoeus uniovarium* is distinguished from other members of the genus by the form and size of the amphids, by the length of the cephalic setae and by the shape of the tail.

Family **MONHYSTERIDAE**

Theristus (Theristus) denticulatus sp. nov.

(Fig. 9)

Material studied. Three males and three females. B.M. (N.H.), Reg. No. 1968. 269.

Distribution in Exe Estuary. Shelly Bank : M.T.L., M.L.W.N.T., M.L.W.S.T.

	a	b	c	V%	Body length (mm.)
Males	23·14	4·05	7·17	—	0·81
	28·00	4·41	6·91	—	0·56
	25·91	4·22	6·71	—	0·57
Females	26·67	4·28	6·78	57·50	0·80
	22·92	4·20	7·05	60·00	0·55
	21·85	4·31	7·11	57·61	0·59

Measurements (in mm. in order of body lengths). Males : Body breadth : 0·035 ; 0·020 ; 0·022. Oesophagus length : 0·200 ; 0·127 ; 0·135. Distance of nerve

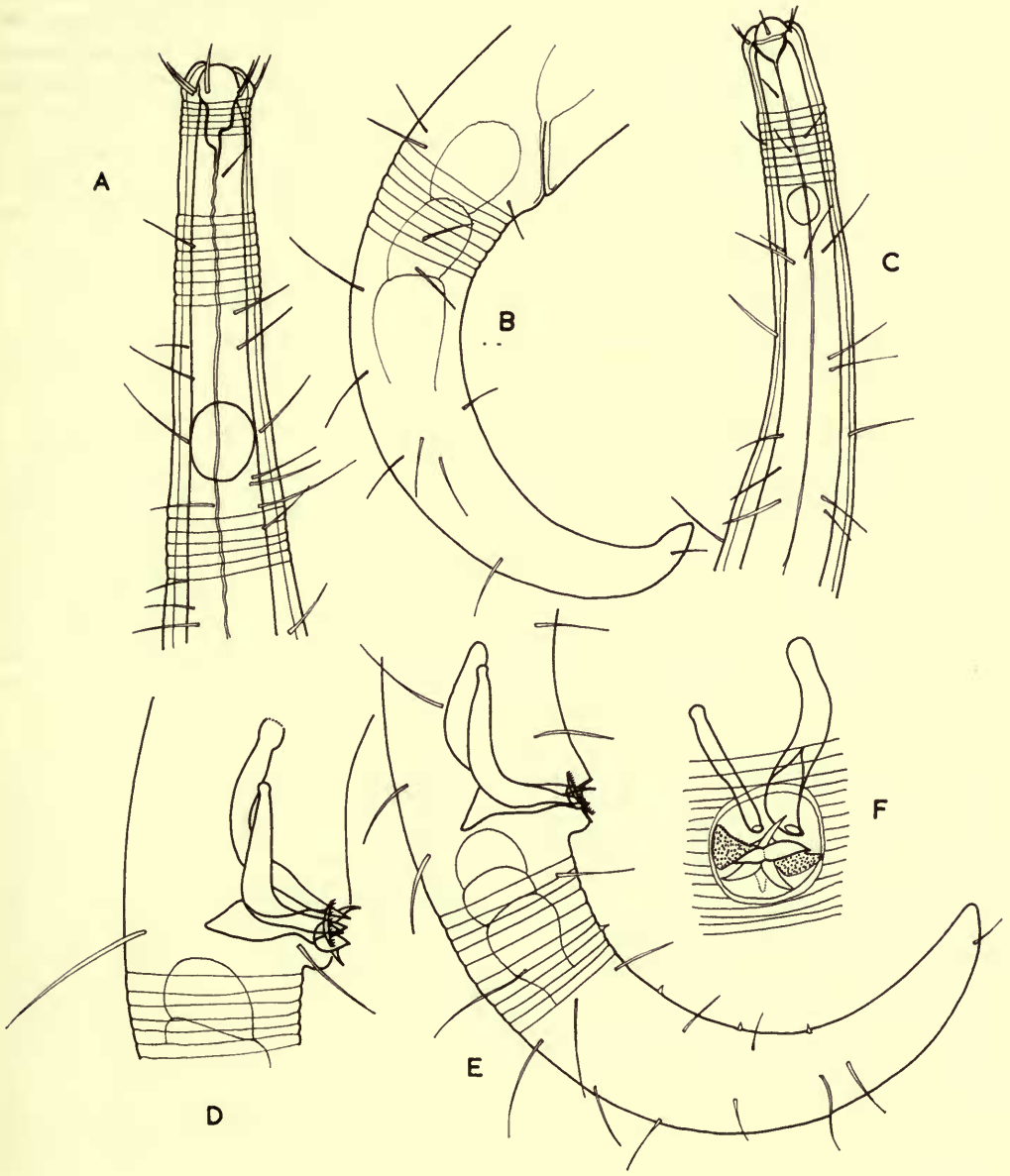


FIG. 9. *Theristus* (*Theristus*) *denticulatus* sp. nov. A, Lateral view of male head. B, Lateral view of female tail. C, Lateral view of female head. D, Lateral view of cloacal region in male. E, Lateral view of tail of another male. F, Ventral view of male cloacal region.

ring from anterior : 0·123 ; 0·073 ; 0·079. Head diameter : 0·009 ; 0·007 ; 0·007. Length of cephalic setae : 0·007 ; 0·004 ; 0·004. Length of longest cervical setae : 0·023 ; 0·012 ; 0·015. Amphid width : 0·008 ; 0·005 ; 0·005. Body diameter at level of amphids : 0·013 ; 0·008 ; 0·008. Distance of amphids from anterior : 0·042 ; 0·017 ; 0·021. Tail length : 0·113 ; 0·081 ; 0·085. Cloacal diameter : 0·026 ; 0·020 ; 0·022. Length of right spicule : 0·026 ; 0·025 ; 0·026. Length of left spicule : 0·032 ; 0·032; 0·032. Gubernaculum length : 0·017 ; 0·015 ; 0·017.

Females : Body breadth : 0·030 ; 0·024 ; 0·027. Oesophagus length : 0·187 ; 0·131 ; 0·137. Distance of nerve ring from anterior : 0·107 ; 0·080 ; 0·079. Head diameter : 0·011 ; 0·007 ; 0·008. Length of cephalic setae : 0·006 ; 0·003 ; 0·004. Length of longest cervical setae : 0·008 ; 0·013 ; 0·012. Amphid width : 0·005 ; 0·004 ; 0·005 ; Body diameter at level of amphids : 0·012 ; 0·009 ; 0·008. Distance of amphids from anterior : 0·022 ; 0·022 ; 0·021. Tail length : 0·118 ; 0·078 ; 0·083. Anal diameter : 0·022 ; 0·019 ; 0·017. Distance of vulva from anterior : 0·46 ; 0·33 ; 0·34. Egg length : — ; — ; 0·042. Egg breadth : — ; — ; 0·021.

The head end is attenuated considerably from a point about half-way down the oesophagus-length. There are ten cephalic setae, and the submedian pairs are only slightly subequal in length. The labial sense organs are not detectable. The structure of the buccal cavity is typical of the genus. The amphids are slightly subcircular and elongated longitudinally. They are situated well posterior on the body, although their position is somewhat variable (Figs. 9A & 9C). The oesophagus broadens considerably towards its posterior end in association with the attenuation of the neck region. Longish setae, up to about three-quarters of the body-width, are scattered over the entire body-surface. The tail is conical (Figs. 9B and 9E).

Male. At the distal end of the gubernaculum is a complex array of structures. There are two flat lateral plates which are triangular when viewed from the ventral aspect, and covered ventrally with minute denticles. In a more median position there is a pair of laterally-curving points, and also three more slender points, one passing anteriorly between the distal tips of the spicules and the other two pointing posterolaterally (Figs. 9D, 9E & 9F). Proximally the gubernaculum bears a short triangular dorsally, or slightly posterodorsally, pointing apophysis. The spicules are unequal in size and structure. The right one is the shorter and is sharply bent in the middle with a narrow rounded slightly cephalate proximal tip and a pointed distal tip. The left spicule is less sharply bent. There is a file of stout conical spines arranged ventrally down the length of the tail. The structure of the gonads is not clear.

Female. There is a single pre-vulvular outstretched ovary and a small post-vulvular sac.

Discussion. The size of the body, position of amphids, etc., are so variable in this species that at first more than one species was thought to be present. However, the measurements and fine structure of the various parts of the male copulatory apparatus proved to be so constant that the specimens are considered monospecific. It is probable, therefore, that the position and size of the amphids are of little value

in delimiting species among the homogeneous group of species to which *T. denticulatus* belongs. This group contains species of the subgenus *Theristus* with unequal spicules and comprises *T. heterospiculum* Allgén, 1932, *T. heterospiculoides* Gerlach, 1952, *T. diversispiculum* Gerlach, 1953, *T. asymetricus* (Wieser, 1956), *T. wimmeri* Wieser, 1959, *T. rhynchonemoides* Hopper, 1961, and *T. roscoffiensis* Vitiello, 1967. *T. problematica* (Allgén, 1927) is a doubtful species, and Wieser's (1956) redescription has been named by Vitiello (1967) as *T. asymetricus*. The present specimens differ from all these species in the complex structure of the gubernaculum and the ventral spines on the male tail.

Theristus (Theristus) interstitialis sp. nov.

(Fig. 10)

MATERIAL STUDIED. Three males. B.M. (N.H.), Reg. No. 1968. 270.

DISTRIBUTION IN EXE ESTUARY. Shelly Bank : M.H.W.S.T., M.L.W.N.T. Orcombe Point : M.L.W.S.T.

	a	b	c	Body length (mm.)
Males	55·00	6·53	9·79	1·43
	53·33	6·32	9·66	1·44
	51·11	6·19	9·65	1·38

MEASUREMENTS (in mm. in order of body lengths). Males : Body breadth : 0·026 ; 0·027 ; 0·027. Oesophagus length : 0·219 ; 0·228 ; 0·223. Distance of nerve ring from anterior : 0·112 ; 0·102 ; 0·120. Head diameter : 0·021 ; 0·018; 0·019. Length of long cephalic setae : 0·021 ; 0·019 ; 0·019. Length of medium cephalic setae : 0·017 ; 0·017 ; 0·017. Length of short cephalic setae : 0·008 ; 0·007 ; 0·009. Amphid diameter : 0·009 ; 0·010 ; 0·009. Body diameter at level of amphids : 0·024 ; 0·022 ; 0·023. Distance of amphids from anterior : 0·016 ; 0·012 ; 0·017. Tail length : 0·146 ; 0·149 ; 0·143. Cloacal diameter : 0·026 ; 0·027 ; 0·027. Spicule length : 0·042 ; 0·039 ; 0·039. Gubernaculum length : 0·081 ; 0·017 ; 0·016.

The cuticle is fairly coarsely striated. The labial setae are prominent and conical, 5μ in length. There are 14 cephalic setae, the submedian pairs being only slightly subequal and the lateral triplets having an additional much shorter seta (Fig. 10A). Body setae are sparse, short and scattered, becoming more numerous on the tail. The buccal cavity and amphids are typical of the genus in structure. The oesophagus is more or less cylindrical throughout its length. The tail is conical (Fig. 10C).

MALE. The gubernaculum has a pair of short rounded caudo-dorsal apophyses proximally, and a pair of lateral projections distally which are each tipped with two teeth (Figs. 10B and 10D). The spicules are paired and equal, strongly cephalate proximally, but distally obscured by the gubernaculum.

Discussion. This species belongs to group B.2. in the key of Wieser (1956), and is distinguished from other members of the group by the long cephalic setae, by the position and size of the amphids and by the structure of the male copulatory apparatus.

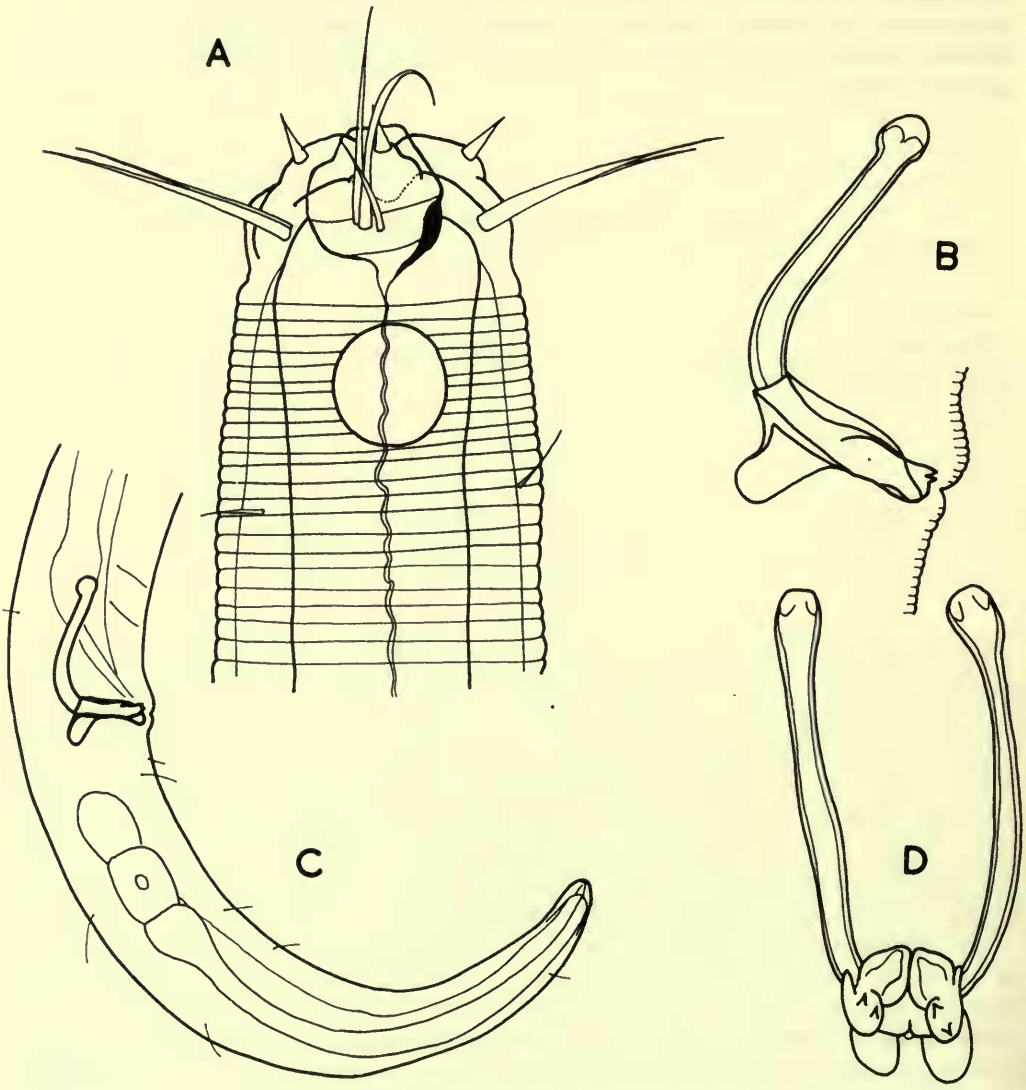


Fig. 10. *Theristus* (*Theristus*) *interstitialis* sp. nov. A, Lateral view of male head. B, Lateral view of spicules and gubernaculum. C, Lateral view of male tail. D, Ventral view of spicules and gubernaculum.

Theristus (Trichotheristus) psammoides sp. nov.

(Fig. 11)

MATERIAL STUDIED. Three males and three females. B.M. (N.H.), Reg. No. 1968. 271.

DISTRIBUTION IN EXE ESTUARY. Shelly Bank : M.T.L., M.L.W.N.T., M.L.W.S.T.

	a	b	c	V%	Body length (mm.)
Males	35·63	4·38	8·70	—	1·14
	36·06	4·58	7·99	—	1·19
	32·29	3·90	8·50	—	1·13
Females	30·00	4·31	8·63	63·04	1·38
	29·74	4·04	7·96	60·18	1·13
	28·72	3·86	10·00	64·29	1·12

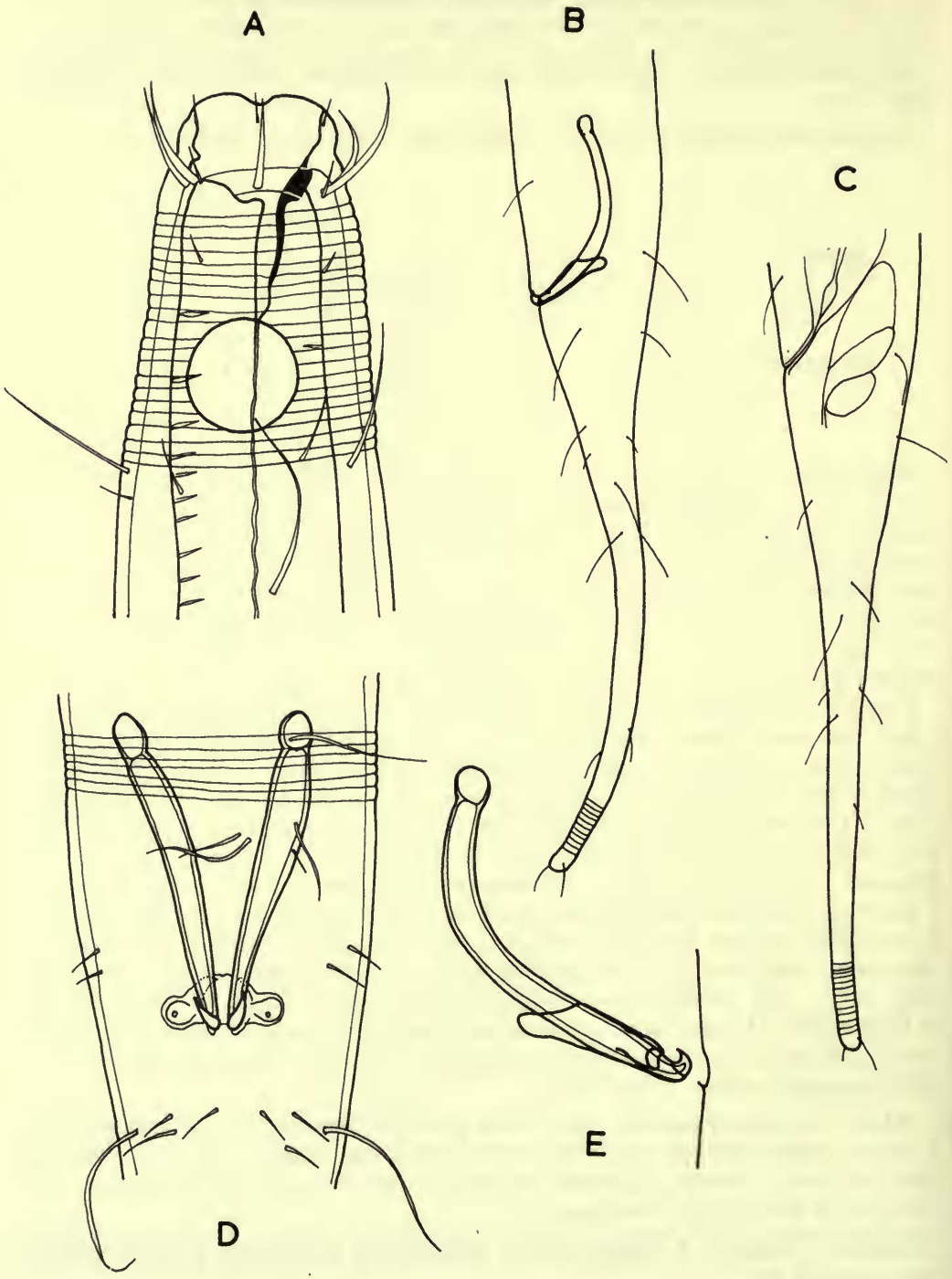
MEASUREMENTS (in mm. in order of body lengths). Males : Body breadth : 0·032 ; 0·033 ; 0·035. Oesophagus length : 0·26 ; 0·26 ; 0·29. Distance of nerve ring from anterior : 0·104 ; 0·109 ; 0·115. Head diameter : 0·017 ; 0·015 ; 0·016. Length of long cephalic setae : 0·011 ; 0·011 ; 0·012. Amphid diameter : 0·010 ; 0·011 ; 0·012. Body diameter at level of amphids : 0·022 ; 0·021 ; 0·022. Distance of amphids from anterior : 0·018 ; 0·017 ; 0·021. Length of longest body setae : 0·024 ; 0·023 ; 0·029. Tail length : 0·131 ; 0·149 ; 0·133. Cloacal diameter : 0·028 ; 0·028 ; 0·027. Spicule length : 0·041 ; 0·041 ; 0·043. Gubernaculum length : 0·016 ; 0·014 ; 0·017.

Females : Body breadth : 0·046 ; 0·038 ; 0·039. Oesophagus length : 0·32 ; 0·28 ; 0·29. Distance of nerve ring from anterior : 0·126 ; ? ; ?. Head diameter : 0·017 ; 0·016 ; 0·017. Length of long cephalic setae : 0·013 ; 0·013 ; 0·014. Amphid diameter : 0·007 ; 0·008 ; 0·009. Body diameter at level of amphids : 0·025 ; 0·024 ; 0·023. Distance of amphids from anterior : 0·017 ; 0·017 ; 0·020. Length of longest body setae : 0·037 ; 0·036 ; 0·037. Tail length : 0·160 ; 0·142 ; 0·122. Anal diameter : 0·031 ; 0·026 ; 0·029. Distance of vulva from anterior: 0·87 ; 0·68 ; 0·72.

There are six small slender labial setae and ten cephalic setae, of which four are very slightly shorter than the remaining six. In some specimens four additional very short setae (about 4μ) can be detected in association with the submedian pairs (Fig. 11A). The amphids are perfectly circular, and are larger in the males than in the females. Longish setae are scattered generally over the body-surface, but are most numerous in the oesophageal region and on the tail. The tail is filiform for its distal two-thirds (Figs. 11B & 11C).

MALE. The gubernaculum has a small rounded dorsally-directed apophysis and a pair of rounded lateral projections at the distal end (Figs. 11D & 11E). The spicules are equal, arcuate, cephalate proximally and strongly hooked distally. The structure of the gonads is not clear.

FEMALE. There is a single anterior outstretched ovary and a small spherical post-vulvular sac.


A
B
C
D
E

Discussion. This species is closest to *T. vicinus* Riemann, 1966, but differs from it in having larger amphids and a different structure of the male copulatory apparatus. It is also close to *T. erectus* Wieser & Hopper, 1967, from which it differs in having larger amphids, no lateral alae and in a differently-shaped gubernaculum.

Family **SPIRINIDAE**

Chromaspirina inglisi sp. nov.

(Fig. 12)

Material studied. Three males and three females. B.M. (N.H.), Reg. No. 1968. 272.

Distribution in Exe Estuary. Orcombe Point : M.L.W.S.T.

	a	b	c	V%	Body length (mm.)
Males	46·00	9·94	20·64	—	1·61
	43·78	10·19	19·52	—	1·62
	48·82	10·00	19·53	—	1·66
Females	38·72	10·34	18·64	58·94	1·51
	46·15	11·11	22.78	62·78	1·80
	42·56	11·09	22·32	63·39	1·83

Measurements (in mm. in order of body lengths). Males : Body breadth : 0·035 ; 0·037 ; 0·034. Oesophagus length : 0·162 ; 0·159 ; 0·166. Distance of nerve ring from anterior : 0·095 ; 0·099 ; 0·097. Head diameter : 0·020 ; 0·014 ; 0·016. Length of shorter cephalic setae : 0·006 ; 0·006 ; 0·006. Length of longer cephalic setae : 0·012 ; 0·011 ; 0·011. Amphid diameter : 0·009 ; 0·010 ; 0·011. Body diameter at level of amphids : 0·023 ; 0·022 ; 0·023. Length of oesophageal bulb : 0·048 ; 0·045 ; 0·043. Breadth of oesophageal bulb : 0·028 ; 0·028 ; 0·026. Tail length : 0·078 ; 0·083 ; 0·085. Cloacal diameter : 0·031 ; 0·033 ; 0·032. Spicule length : 0·048 ; 0·054 ; 0·052. Gubernaculum length : 0·025 ; 0·022 ; 0·023.

Females : Body breadth : 0·039 ; 0·039 ; 0·043. Oesophagus length : 0·146 ; 0·162 ; 0·165. Distance of nerve ring from anterior : 0·082 ; ? ; 0·102. Head diameter : 0·014 ; 0·019 ; 0·020. Length of shorter cephalic setae : 0·005 ; 0·006 ; 0·006. Length of longer cephalic setae : 0·013 ; 0·011 ; 0·012. Amphid diameter : 0·011 ; 0·012 ; 0·010. Body diameter at level of amphids : 0·022 ; 0·026 ; 0·027. Length of oesophageal bulb : 0·043 ; 0·043 ; 0·051. Breadth of oesophageal bulb : 0·028 ; 0·030 ; 0·026. Tail length : 0·081 ; 0·079 ; 0·082. Anal diameter : 0·029 ; 0·028 ; 0·032. Distance of vulva from anterior : 0·89 ; 1·13 ; 1·16. Egg length : 0·123 ; — ; —. Egg breadth : 0·024 ; — ; —.

Fig. 11. *Theristus* (*Trichotheristus*) *psammoides* sp. nov. A, Lateral view of male head. B, Lateral view of male tail. C, Lateral view of female tail. D, Ventral view of male cloacal region. E, Lateral view of spicules and gubernaculum.

The head is invaginated in most specimens. Those with a head diameter of 0·019–0·020 mm. are the least invaginated and this should be taken as the correct head-diameter. The cuticle is marked by fine transverse striations commencing at the

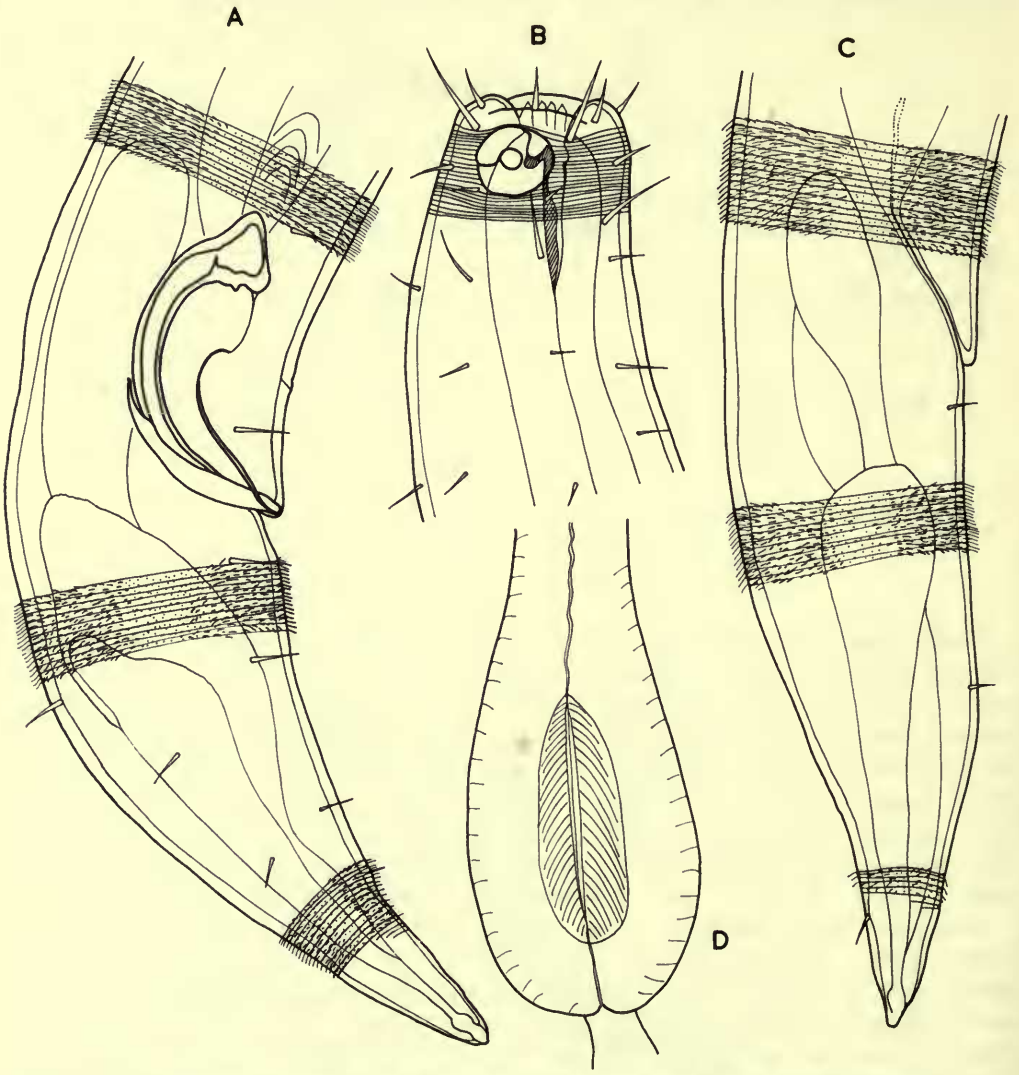


FIG. 12. *Chromaspirina inglisi* sp. nov. A, Lateral view of male tail. B, Lateral view of male head. C, Lateral view of female tail. D, Oesophageal bulb.

anterior border of the amphids and extending to the spinerette on the tail. The body-surface is covered uniformly with very fine hairs, which commence a short distance posterior to the head. These are probably cuticular in origin, but the possibility that they are epigrowths of unicellular cyanophyecous algae cannot be excluded, since these are known to form associations with other species of nematode (e.g.

Leptonemella species). The lips and labial sense-organs are not visible, because of the invagination of the head. There is an anterior circle of six short cephalic setae, and four longer setae just posterior to them (Fig. 12B). There is a ring of indistinct odontia present in the anterior portion of the buccal cavity, and the posterior portion contains a prominent heavily-cuticularized dorsal tooth opposed by a pair of very small subventral projections. The amphids describe a single rounded loop.

The oesophagus has a pyriform posterior bulb, the cuticular lining of which is not markedly thickened (Fig. 12D). Scattered setae between 0·005 and 0·013 mm. in length extend from the head to about 30% of the way down the oesophagus. The middle region of the body is virtually devoid of setae, but they become fairly numerous on the tail, especially in the male. The tail is conoid, and the spinerette unstriated (Figs. 12A & 12C).

Male. The gubernaculum is slender and crescentic. It is closely applied to the spicules. The spicules are arcuate, strongly cephalate proximally, and have a prominent ventral ala (Fig. 12A). A small pore is present in the cuticle a short distance in front of the cloaca, but otherwise supplements are absent. The testis appears to be single and outstretched.

Female. The ovaries are paired, symmetrical, opposed and reflexed. The eggs are very elongate.

Discussion. This species is very similar to *C. pontica* Filipjev, 1918, *sensu* Gerlach, 1951, but as Wieser & Hopper (1967) point out the conspecificity of Gerlach's and Filipev's species is doubtful. In the type the amphids are smaller, the cephalic setae only 5μ in length and there are some differences in the structure of the gubernaculum. The present specimens agree with Gerlach's in all respects, except for the uniform covering of fine hairs, which could easily have been overlooked. Otherwise they would appear to belong to the same species.

Family **MICROLAIMIDAE**

Microlaimus spirifer sp. nov.

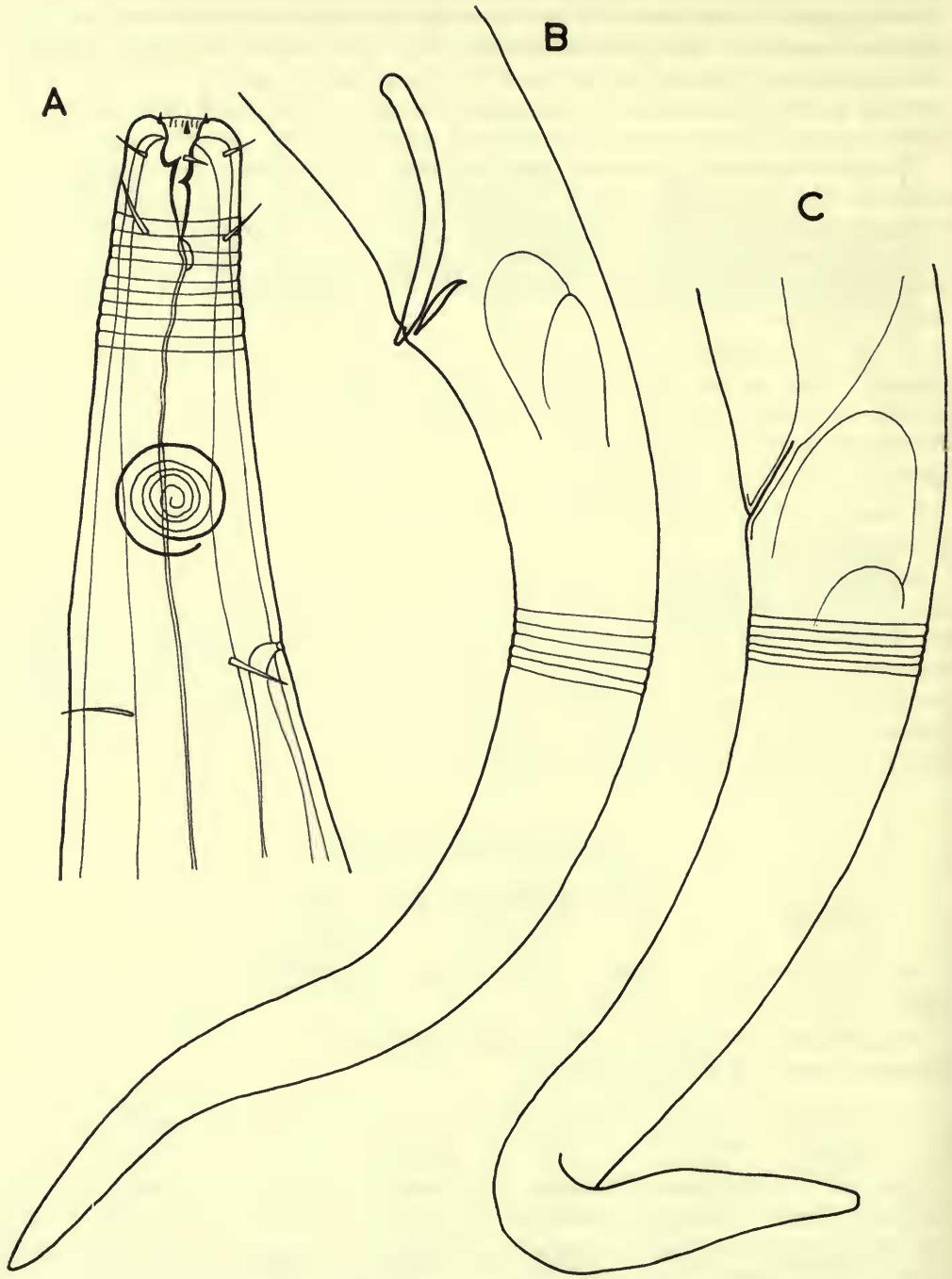
(Fig. 13)

Material studied. Three males and one female. B.M. (N.H.), Reg. No. 1968. 273.

Distribution in Exe Estuary. Shelly Bank : M.T.L., M.L.W.N.T., M.L.W.S.T. Orcombe Point : M.H.W.N.T., M.T.L.

	a	b	c	V%	Body length (mm.)
Males	36·55	7·31	11·16	—	1·06
	38·00	6·69	9·79	—	0·95
	36·67	6·24	8·54	—	0·88
Female	37·67	6·48	9·68	53·26	0·92

Measurements (in mm. in order of body lengths). Males: Body breadth :


A
B
C

0·029 ; 0·025 ; 0·024. Oesophagus length : 0·145 ; 0·142 ; 0·141. Distance of nerve ring from anterior : 0·066 ; 0·077 ; 0·087. Distance of excretory pore from anterior : 0·040 ; ? ; ?. Length of oesophageal bulb : 0·032 ; 0·032 ; 0·032. Breadth of oesophageal bulb : 0·021 ; 0·018 ; 0·018. Head diameter : 0·009 ; 0·009 ; 0·008. Length of longer cephalic setae : 0·006 ; 0·005 ; 0·005. Length of shorter cephalic setae : 0·003 ; 0·003 ; 0·003. Length of buccal cavity : 0·010 ; 0·009 ; 0·011. Amphid diameter : 0·009 ; 0·009 ; 0·008. Body diameter at level of amphids : 0·014 ; 0·013 ; 0·012. Distance of amphids from anterior : 0·027 ; 0·024 ; 0·024. Tail length : 0·095 ; 0·097 ; 0·103. Cloacal diameter : 0·017 ; 0·018 ; 0·018. Spicule length : 0·025 ; 0·023 ; 0·022. Gubernaculum length : 0·008 ; 0·007 ; 0·006.

Female : Body breadth : 0·030. Oesophagus length : 0·142. Distance of nerve ring from anterior : 0·083. Length of oesophageal bulb : 0·031. Breadth of oesophageal bulb : 0·020. Head diameter : 0·008. Length of longer cephalic setae : 0·006. Length of shorter cephalic setae : 0·003. Length of buccal cavity : 0·011. Amphid diameter : 0·008. Body diameter at level of amphids : 0·013. Distance of amphids from anterior : 0·024. Tail length : 0·095. Anal diameter : 0·016. Distance of vulva from anterior : 0·49.

The cuticle is transversely striated. The head has the usual arrangement of sense organs ; a ring of six small conical labial papillae, an anterior ring of six short cephalic setae and a posterior ring of four longer setae (Fig. 13A). The buccal cavity is fairly well cuticularized. It contains a dorsal and ventral tooth of about equal size, the dorsal one being the more anterior. There is a very small posterior cavity set off from the main buccal cavity by a constriction. The amphids are spiral, describing about 6·5 turns, the outer margin of the amphid being more prominent than the inner spiral. There are four longish setae situated at about the level of the excretory pore, but otherwise the body is naked. The oesophagus terminates in a pyriform bulb. The tail is long and conoid (Figs. 13B and 13C).

Male. The gubernaculum is very small, and the spicules are only slightly bent, rounded proximally and pointed distally. There are no supplements.

Female. The ovaries are paired, symmetrical, opposed and reflexed.

Discussion. This species is characterized by the posterior position and spiral form of the amphids, by the form of the copulatory apparatus in the male, and by the long tail.

Family **CYATHOLAIMIDAE**

Pomponema reducta sp. nov.

(Fig. 14)

Material studied. Three males and three females. B.M. (N.H.), Reg. No. 1968. 274.

Fig. 13. *Microlaimus spirifer* sp. nov. A, Lateral view of male head. B, Lateral view of male tail. C, Lateral view of female tail.

Distribution in Exe Estuary. Shelly Bank : M.L.W.S.T. Orcombe Point : M.H.W.N.T., M.L.W.S.T.

	a	b	c	V%	Body length (mm.)
Males	46·25	7·05	10·96	—	1·48
	43·44	6·18	10·67	—	1·39
	46·25	6·95	9·67	—	1·48
Females	33·33	6·22	10·94	61·79	1·40
	42·65	6·33	10·51	61·38	1·45
	40·79	6·22	10·20	59·35	1·55

Measurements (in mm. in order of body lengths). Males : Body breadth : 0·032 ; 0·032 ; 0·032. Oesophagus length : 0·210 ; 0·225 ; 0·213. Distance of nerve ring from anterior : ? ; 0·093 ; ?. Distance of excretory pore from anterior : 0·117 ; ? ; ?. Head diameter : 0·023 ; 0·022 ; 0·024. Length of labial setae : 0·004 ; 0·004 ; 0·004. Length of cephalic setae : 0·010 ; 0·009 ; 0·010. Amphid diameter : 0·010 ; 0·009 ; 0·010. Body diameter at level of amphids : 0·024 ; 0·024 ; 0·026. Tail length : 0·135 ; 0·138 ; 0·153. Cloacal diameter : 0·030 ; 0·025 ; 0·028. Spicule length : 0·043 ; 0·046 ; 0·046. Gubernaculum length : 0·023 ; 0·026 ; 0·027. Distance of anterior supplement from cloaca : 0·330 ; 0·315 ; 0·295.

Females : Body breadth : 0·042 ; 0·034 ; 0·038. Oesophagus length : 0·225 ; 0·229 ; 0·249. Distance of excretory pore from anterior : ? ; 0·127 ; ?. Head diameter : 0·023 ; 0·024 ; 0·024. Length of labial setae : 0·004 ; 0·004 ; 0·004. Length of cephalic setae : 0·008 ; 0·009 ; 0·010. Amphid diameter : 0·008 ; 0·007 ; 0·007. Body diameter at level of amphids : 0·026 ; 0·025 ; 0·026. Tail length : 0·128 ; 0·138 ; 0·152. Anal diameter : 0·023 ; 0·024 ; 0·025. Distance of vulva from anterior : 0·865 ; 0·89 ; 0·92.

The cuticle is marked by transverse rows of rounded punctuations, and there is a marked lateral differentiation. Punctuations on the head are small, sparse and irregularly arranged, but just posterior to the amphids they become larger and closer together, although still not arranged in definite rows (Figs. 14A & 14B). Along the length of the oesophagus the markings begin to sort themselves into distinct transverse rows, and at the base of the oesophagus the lateral differentiation begins. This comprises four files of larger dots, which gradually increase in size down the length of the body. They are very large and rather irregular in shape in the anal or cloacal region, and extend about two-thirds of the way down the tail-length.

The mouth is surrounded by six small rounded lips each bearing a stout conical labial seta. There are also twelve slender and much shorter setae in positions corresponding with the tips of the buccal rugae (Figs. 14A & 14B). There appear to be only six cephalic setae, each consisting of a stout basal half and a filiform tip. The four shorter cephalic setae reported from all other species of *Pomponema* appear to be absent, unless they are very closely adherent to the larger ones. This reflects the trend begun in *P. stomachor* Wieser, 1954 and *P. polydonta* Murphy, 1963, in which

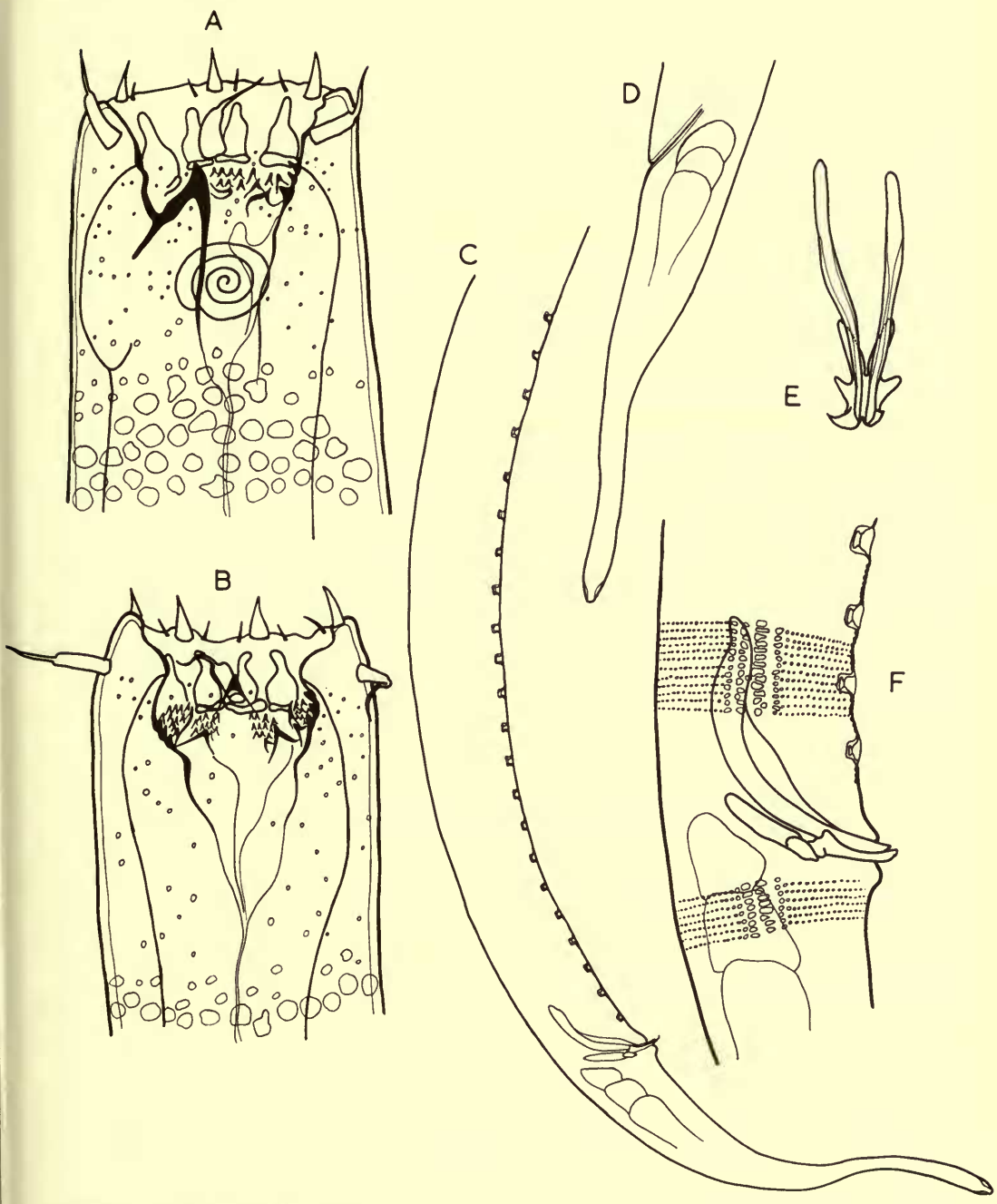


FIG. 14. *Pomponema reducta* sp. nov. A, Lateral view of female head. B, Ventral view of female head. C, Posterior end of male. D, Lateral view of female tail. E, Ventral view of spicules and gubernaculum. F, Lateral view of cloacal region in male.

these four setae are very reduced. The buccal cavity is of the typical form. Anteriorly its walls are supported by twelve buccal rugae. More posteriorly there is a large dorsal tooth opposed by a pair of much smaller subventral teeth and additional groups of denticles arranged as in Figs. 14A and 14B. The amphids describe a spiral of 4–4·5 turns in the male and 3·5 turns in the female.

The oesophagus has a distinct anterior pharyngeal bulb dorsally, and broadens gradually towards its posterior end, with no definite posterior bulb. There are no somatic setae. The tail is long and slender, its proximal half tapering and distal half filiform (Figs. 14C & 14D).

Male. The gubernaculum consists of two identical halves each having an outwardly-curving point distally and a rounded lateral projection near the middle (Figs. 14E & 14F). The spicules are arcuate and have small ventral alae. There are 20–24 equally spaced pre-cloacal supplements, the cuticle between them being lamellated and giving them the complex appearance which is characteristic of the genus. The testes are not visible.

Female. The ovaries are paired, more or less symmetrical, opposed and reflexed.

Discussion. This species is closest to *P. polydonta* Murphy, 1963, but differs from it in several respects. The absence of the four shorter cephalic setae has already been noted. In *P. polydonta* the longer cephalic setae are 23μ long as compared with 8–10μ in *P. reducta*. These setae are similar in structure, since Murphy states for *P. polydonta* that 'there is indication of segmentation and articulation of larger setae on some specimens at a point one-third to one-half of the length from the base'. The buccal denticles in *P. polydonta* are arranged in two rows, and not in discrete groups as in the present species. The spicules in *P. polydonta* appear to be non-alate.

Paracanthonchus opheliae sp. nov.

(Figs. 15 & 16)

Material studied. Three males and two females. B.M. (N.H.), Reg. No. 1968. 275.

Distribution in Exe Estuary. Shelley Bank : M.T.L., M.L.W.N.T., M.L.W.S.T. Orcombe Point : M.T.L., M.L.W.N.T.

	a	b	c	V%	Body length (mm.)
Males	32·92	9·03	10·09	—	2·14
	37·12	9·13	10·95	—	2·19
	34·33	9·62	10·70	—	2·30
Females	20·65	9·41	12·57	50·00	2·54
	18·46	10·31	11·09	49·62	2·64

Measurements (in mm. in order of body lengths). Males : Body breadth : 0·065 ; 0·059 ; 0·067. Oesophagus length : 0·237 ; 0·240 ; 0·239. Distance of nerve ring from anterior : 0·140 ; 0·141 ; 0·137. Distance of excretory pore from anterior : 0·054 ; 0·040 ; ?. Length of longer cephalic setae : 0·018 ; 0·016 ; 0·018. Length of shorter cephalic setae : 0·010 ; 0·009 ; 0·008. Head diameter : 0·031 ; 0·038 ; 0·035. Amphid diameter : 0·014 ; 0·014 ; 0·014. Body diameter at level of amphids : 0·039 ; 0·041 ; 0·040. Tail length : 0·212 ; 0·200 ; 0·215. Cloacal diameter : 0·056 ; 0·055 ; 0·063. Spicule length : 0·059 ; 0·056 ; 0·071. Gubernaculum length : 0·067 ; 0·064 ; 0·065.

Females : Body breadth : 0·123 ; 0·143. Oesophagus length : 0·270 ; 0·256 ; Distance of nerve ring from anterior : 0·177 ; ?. Distance of excretory pore from anterior : 0·052 ; ?. Length of longer cephalic setae : 0·017 ; 0·018. Length of shorter cephalic setae : 0·008 ; 0·010. Head diameter : 0·038 ; 0·053. Amphid diameter : 0·008 ; 0·009. Body diameter at level of amphids : 0·055 ; 0·059. Tail length : 0·202 ; 0·238. Anal diameter : 0·052 ; 0·074. Distance of vulva from anterior : 1·27 ; 1·31.

This is a relatively large species. The cuticle is marked by transverse rows of small rounded punctations which commence at the level of the bases of the cephalic setae. There is no lateral differentiation. Type-1 campaniform organs (see Inglis, 1963) are found in two lateral files down each side of the body, commencing just posterior to the amphids and extending almost to the tip of the tail. In the middle of the body these files are about 16μ apart. There are six files of setae down the length of the body, and these are shorter and more widely spaced posterior to the base of the oesophagus.

In all specimens the head is somewhat invaginated, so that the labial sense-organs cannot be seen. The arrangement of cephalic setae is typical of the genus, with an anterior ring of six short setae and more posteriorly four longer setae. The buccal cavity is cyathiform and contains twelve buccal rugae. The dorsal tooth is relatively small (Fig. 15A). The amphids in the male describe a spiral of 4 turns and in the female 3·5 turns. There are two large ocelli positioned dorsolaterally 1–1·5. head diameters from the anterior. They each consist of an anterior lensatic unit and a posterior chomatic unit containing dark blackish pigment granules. The pigment can only be seen in living or freshly killed specimens, and is removed completely on clearing in glycerine.

The oesophagus is more or less cylindrical throughout its length. Numerous large pennate diatoms were seen in the gut of several specimens. The tail is conical (Figs. 15D & 16) and in the male bears two files of longish ventrolateral setae.

Male. The spicules are curved and have broad ventral alae. They are pointed distally and the proximal end has an undulating appearance (Figs. 15B & 15C). The gubernaculum is a complex paired structure, the distal end of which is set off from the long proximal portion as a pair of massive swellings which appear rectangular in lateral view. Each swelling bears three large teeth, the arrangement of which is shown in Figs. 15B & 15C. Anteriorly two small protuberances project from the distal portion of the gubernaculum on either side of the spicules. The proximal part of the gubernaculum consists of two long club-shaped structures which lie very

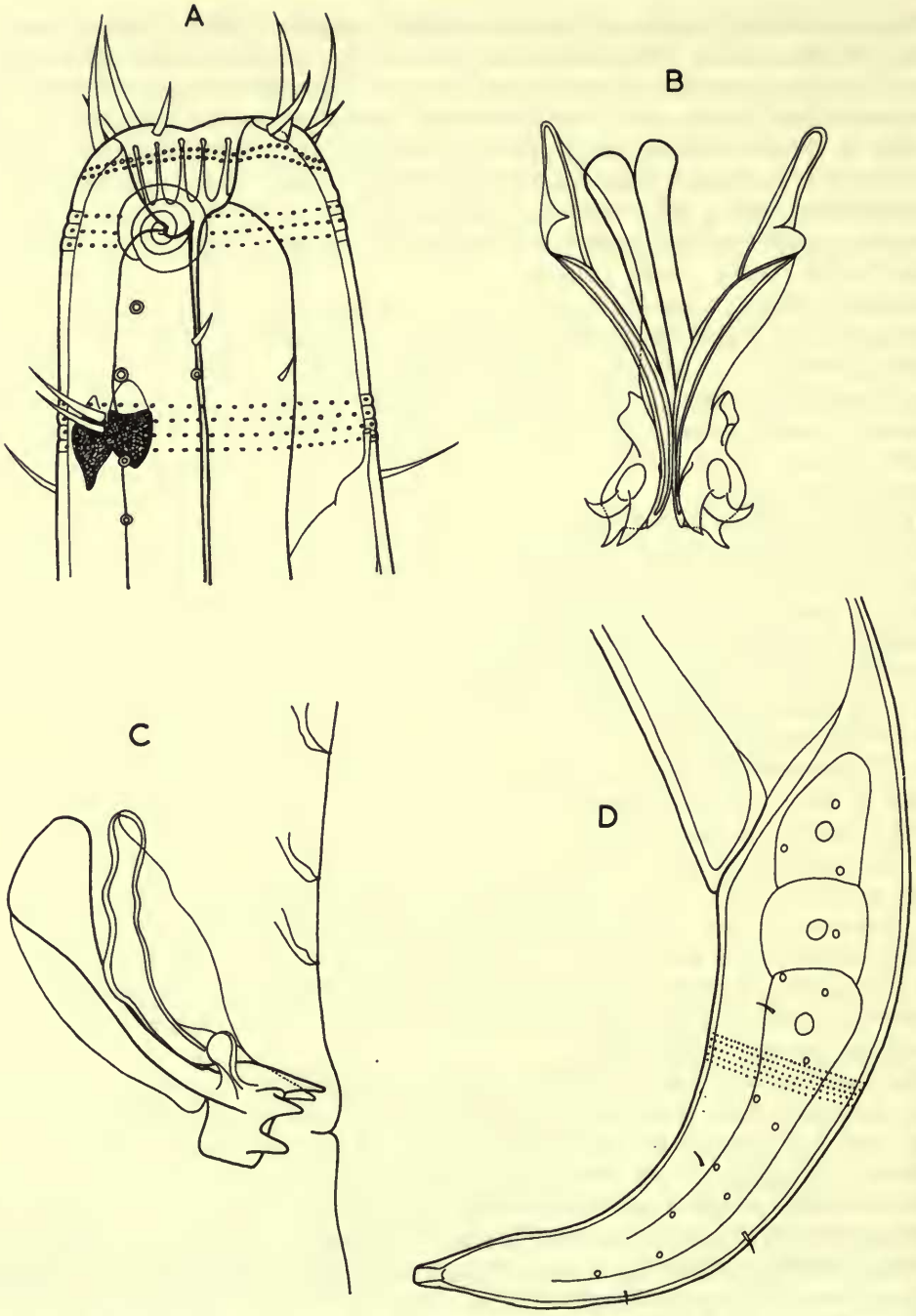


FIG. 15. *Paracanthonchus opheliae* sp. nov. A, Lateral view of male head. B, Ventral view of spicules and gubernaculum. C, Lateral view of spicules and gubernaculum. D, Lateral view of female tail.

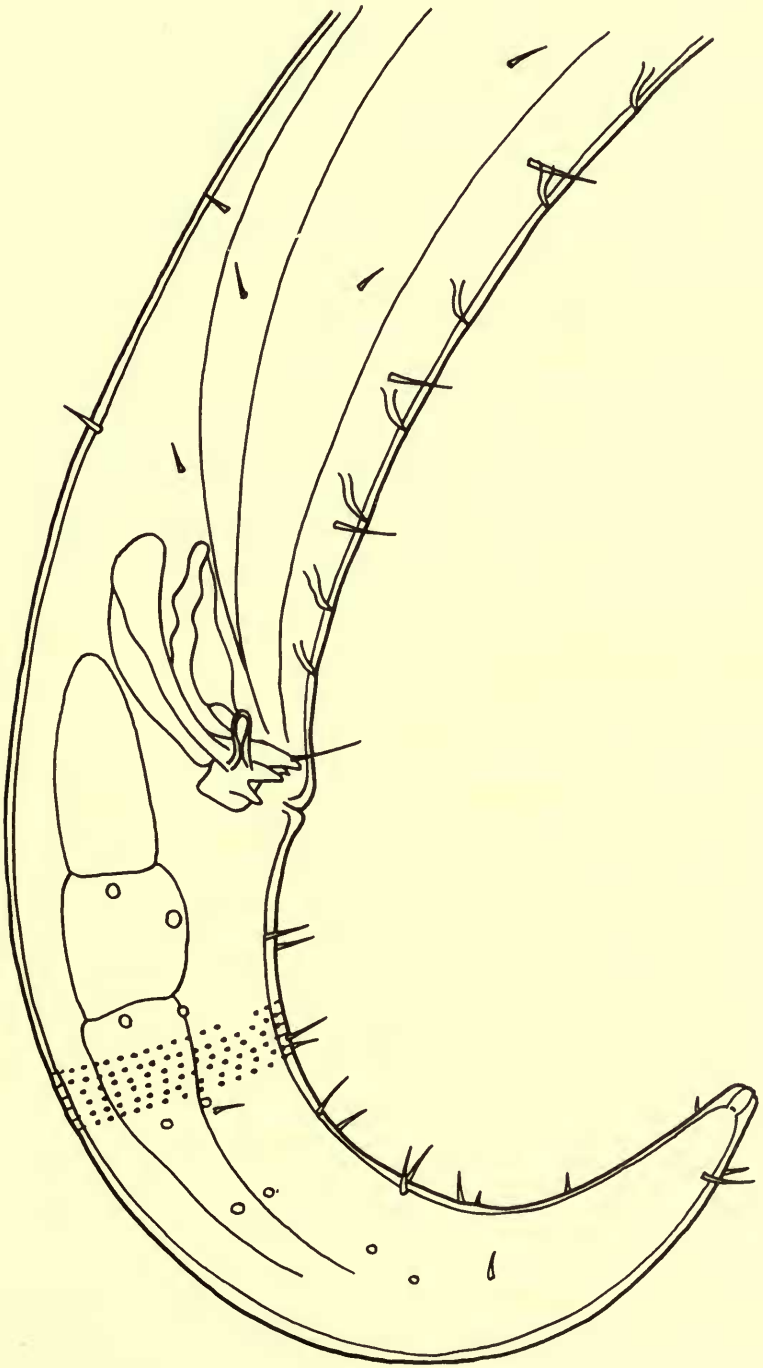


FIG. 16. *Paracanthonchus opheliae* sp. nov., lateral view of male tail.

close to one another. They bear narrow alae along their dorsal edges. There are seven tubular pre-cloacal supplements arranged as in Fig. 16. The testes are paired, opposed and outstretched, the anterior one commencing about one-third of the way down the length of the body.

Female. The ovaries are paired, symmetrical, opposed and reflexed. The eggs are roughly spherical, about 65μ in diameter.

Discussion. This species belongs to group 'B' in the key of Wieser (1954). It differs from all other species assigned to this group in the structure of the gubernaculum and spicules.

ACKNOWLEDGEMENTS

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